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G. Garrard del.

¾ of an inch to a foot.

Working Hereford Ox.

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PRACTICAL AGRICULTURE;

OR,

A COMPLETE SYSTEM

OF

MODERN HUSBANDRY:

WITH THE

METHODS OF PLANTING,

AND THE

MANAGEMENT OF LIVE STOCK.

BY R. W. DICKSON, M. D.

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PRACTICAL AGRICULTURE.

SECTION XI.

Cultivation of Arable Land (continued).

PEAS.—This is a crop which is leſs certain than moſt others, and even when productive moſtly inferior in value, except in particular ſituations, as near large towns, when produced early for the table, to thoſe of the grain kind. Yet from ſuch crops when full, having much tendency to improve the lands on which they are cultivated, as well as to render them clean and free from weeds, they are cultivated to a conſiderable extent in many diſtricts of the kingdom. The varieties of peas employed in cultivation are extremely numerous; but thoſe adapted to field culture are generally diſtinguiſhed into two kinds, the early and the late: of the former are the early *Charlton*, the *golden hotſpur*, and the common *white*; of the latter all thoſe of the gray kind, as the *Marlborough gray*, the *horn gray*, the *maple gray*, &c.: the firſt of theſe ſorts is generally conſidered the beſt for field huſbandry.

This crop may be grown upon almoſt any ſort of ſoil, but ſucceeds beſt on ſuch as are dry and poſſeſs a middling degree of lightneſs, with a tolerably mellow condition, having a portion of calcareous matter in their compoſition, as without this ingredient peas are ſaid not to fill or ripen ſo perfectly. Pea crops are moſtly put in after wheat, oats, or other kinds of grain. They may likewiſe ſucceed clover or ſaintfoin in many caſes with advantage; and on old ley grounds, when newly broken up, where danger is apprehended from the worm, they may often be found a beneficial crop. But after whatever ſort of crop peas may be cultivated, it will generally be neceſſary to have the ſoil reduced into a tolerable ſtate of pulveriſation before they are put in, and, where it can be ſpared, a portion of manure applied. For this purpoſe, a compoſt of earth, dung and lime may be the moſt uſeful, eſpecially where there is little or no calcareous matter in the ſoil. Pea crops may thus be rendered not only more abundant but better filled, and ripened at an earlier period.

Time of ſowing.—In ſowing this kind of crop, much muſt depend upon the intentions of the cultivator: when the peas are intended for podding, in order to be ſent green to the market, which may be the moſt advantageous appropriation of the crop near large towns, where they can be readily diſpoſed of, they ſhould be put in ſucceſſion at the diſtance of ten days or a fortnight from about the middle of January to the latter end of March, beginning with the lands that are moſt dry and mellow, and proceeding to ſuch as are more moiſt and heavy. In this mode of culture regular ſupplies may be kept up for the daily conſumption of the markets. The white early ſorts are in theſe caſes to be employed. It is however the practice in ſome of the ſouthern diſtricts, in order to have them more early, to ſow the ſeed in the autumn, as a little after Michaelmas. This, from the froſts during the winter, is often, however, a dangerous method, and ſhould perhaps never be attempted, except where the land lies extremely dry and warm, and is very rich in quality*. But for the general crops, when the cultivator has no view of the above kind, they may be ſown as early in March as the ſoil can be put into a proper ſtate of preparation. In theſe caſes the gray ſorts are moſtly employed. When the ſeed is put in at a later period, as in April, the white or more early kind ſhould conſtantly be preferred, as the produce becomes ripe more early, which is a matter of importance in pea crops.

Seed.—The proportion of ſeed muſt vary according to the difference of the circumſtances under which the crop is cultivated, the manner in which it is put in, and the intention with which it is grown. When the ſeed is put in on rich ground in the autumn, with the deſign of pulling the pods green, it may be in the quantity of three buſhels and a half or four buſhels to the acre; a larger proportion than in other caſes being generally allowed. The peas in thoſe caſes ſhould be put in in rows, at the diſtance of about three feet from each other, in order that proper cultivation may be applied afterwards. This mode of practice is common about Dartford in Kent, where the green pea ſyſtem of huſbandry is carried on extenſively and with much profit to the farmer. But for the general ſowings, when the land is in tolerable condition, from three to three buſhels and a half is the common allowance, the earlier ſowings requiring rather the moſt ſeed.

If the view of the cultivator in the growth of pea crops be chiefly that of cleaning and ameliorating the land for the reception of other ſorts of crops, as thoſe of grain, turnips, &c. or the producing much ſtraw, a larger quantity of ſeed may be uſeful, as by that means the ſurface of the ſoil may be more perfectly

* Synopſis of Huſbandry, p. 118.

covered, and a more close and stagnated state of the air produced upon it in consequence; at the same time that the plants are drawn up to a greater length of stem or straw, by which the land will be greatly mellowed and enriched, and the small weeds smothered and destroyed at the time that a larger proportion of fodder is produced. But in cases where the principal object is that of the crop of corn that is to follow, the proportion of seed may be less, as in that way there will be a more free circulation of air, and a more perfect admission of light and heat from the sun, for the growth and maturation of the pea crop, and at the same time less exhaustion of the soil. It is usual in these cases, in many districts, to put the seed into the ground in the broadcast method; but the drill or row system is mostly to be preferred, as being more regular, saving considerably in the proportion of seed, and admitting of cultivation afterwards with more ease and advantage. In this last method two bushels, or two bushels and a half, may often be a sufficient allowance of seed. Different implements have been contrived for this use, but the most convenient is probably a small light sort of wheel-plough, to the body of which a sort of seed-box is attached, through the bottom of which the axis of a light wheel passes, by which the sowing is regulated, and which is pulled up and prevented from letting the peas be deposited at the ends of the ridges, or other places, as in turning, by a string attached to the handle. It may be conveniently employed with one or two horses.

The proper distance of drilling this kind of crop is mostly about twelve or sixteen inches for hand-hoeing; but where the horse-hoe is employed, from two to three feet; and the depth to which the seed is deposited, from two to three inches.

In some districts the seed is put by the hand into drills mostly made cross-ways of the ridges, but occasionally in the direction of them, at the distance of about fifteen inches from each other, and afterwards covered in by means of hoes. In some instances also a bush-harrow is drawn over the surface, by which the land is rendered smooth and even *.

Where this sort of crop is cultivated on a ley preparation, the best method is probably to dibble the seed in. This is the practice constantly followed by the best cultivators in some districts †.

Though the practice of steeping this sort of seed is seldom had recourse to by the cultivators of peas, it is probable that the later sown crops may be greatly

* Corrected Report of Middlesex, p. 194. † Corrected Report of Suffolk.

benefited by it, as the vegetation of the plants may be rendered more quick, regular, and uniform.

It is the cuſtom in Hertfordſhire, and ſome other diſtricts, to ſow beans, or even oats, ſometimes with the peas, with a view of keeping them up. Theſe mixtures are, however, practices that can never be adopted with advantage, as the different crops, from their being of unequal growth, muſt conſtantly be liable to injure each other.

After-culture.—The uſe of the hoe in ſtirring the intervals, and earthing up the young plants where the crop is put in in rows by the drill or dibble, is of eſſential advantage in promoting their growth, and protecting them from the injuries of the ſeaſon. Where the method of hand-culture prevails, it is the general cuſtom to have recourſe to two hoeings; the firſt when the plants are about two or three inches in height, and again juſt before the period in which they come into bloſſom. In this way the vigorous vegetation of the young crop is ſecured, and a freſh ſupply of nouriſhment afforded for the ſetting of the pods and the filling of the peas. At the laſt of theſe operations, the rows ſhould be laid down, and the earth well placed up to them, the weeds being previouſly extirpated by hand labour *.

In ſome parts of Kent, where this ſort of crop is much grown, it is the practice, when the diſtance of the rows is ſufficiently great, to prevent the vegetation of weeds, and forward the growth of the pea crops, by occaſional *edge-hoeing*, and the uſe of the brake-harrow, the mold being laid up to the roots of the plants at the laſt operation, by fixing a piece of wood to the harrow. This ſhould however only be laid up on one ſide, the peas being always placed to that which is the moſt fully expoſed to the effects of the ſun. The edge-hoeing is performed at the rate of from two to three ſhillings the acre, according to the nature of the land.

There are many inducements to the cultivation of this crop, on ſuitable ſoils, in the vicinity of large towns, where the demand for green peas is conſiderable; ſuch as the ready ſupply of money that is thus provided for the other expenſive operations during the ſummer months, the facility of thus rendering the land proper for the growth of turnips, and the large ſupply of fodder that is afforded by the ſtems of the plants when properly ſecured; notwithſtanding the danger of ſuch crops during the winter, and even in the ſpring months, when the ſeaſons prove unfavourable, and the heavy expences incurred in the gathering and diſpoſal of them.

* Corrected Report of Middleſex.

It is frequently a practice with the large cultivators of early green pea crops, in the neighbourhood of London, to diſpoſe of them, by the acre, to inferior perſons, who procure the *podders*; but the ſmaller farmers for the moſt part provide this deſcription of people themſelves, who generally apply at the proper ſeaſon for the purpoſe. The buſineſs of picking or podding the peas is uſually performed by the labourers at a fixed price for the ſack, of four heaped buſhels. The number of this ſort of perſons is generally in the proportion of about four to the acre, the labour proceeding on the Sundays as well as other days. It is ſometimes the cuſtom to pick the crops over twice, after which the reſt are ſuffered to ſtand till they become ripe for the purpoſe of ſeed. This, however, moſtly ariſes from the want of pickers, as it is conſidered as a loſs, from the peas being leſs profitable in their ripe ſtate than when green. Beſides, they are often improper for the purpoſe of ſeed, as being the worſt part of the crop. It is therefore better to have them clear picked when hands can be procured. After this they are loaded into carts, and ſent off at ſuitable times, according to the diſtance of ſituation, ſo as to be delivered to the ſaleſmen in the different markets, from about three to five o'clock in the morning *. In many caſes in other parts the early gatherings are, however, ſent to the markets in half-buſhel ſieves, and are frequently diſpoſed of at the high price of five ſhillings the ſieve; but at the after periods they are uſually conveyed in ſacks of a narrow form, made for the purpoſe, which contain about three buſhels each, which, in the more early parts of the ſeaſon, often fetch twelve or fourteen ſhillings the ſack, but afterwards moſtly decline conſiderably, in ſome ſeaſons ſo much as ſcarcely to repay the expences. This ſort of crop affords the moſt profit in ſuch pea ſeaſons as are inclined to be cool, as under ſuch circumſtances the peas are moſt retarded in their maturation or ripening, and of courſe the markets kept from being over-abundantly ſupplied.

The expence of gathering green peas is different, according to the difficulty of procuring podders, the bulk or abundance of the crops, and the kind of pea or ſize of the pods. Thoſe of the larger ſorts, ſuch as the marrowfats, being in the county of Middleſex about one ſhilling, and thoſe of the ſmaller kinds, as the Charlton, from fifteen to eighteen pence, the ſack †. In Kent the uſual price is about fourteen pence the ſack for podding, one ſhilling for conveying them to the market, and three pence the ſack for the ſaleſman ‡.

* Middleton's Report of Middleſex.

† Ibid.

‡ Synopſis of Huſbandry.

The produce of both the early and late pea crops vary much according to the nature of the ſeaſon, and many other circumſtances. The average of the early crops in Middleſex is ſuppoſed, by the author of the Report of that diſtrict, to be from about twenty-five to thirty ſacks the acre, which, ſelling at from eight to eighteen ſhillings the ſack, afford about eighteen pounds the acre. The author of the Synopſis of Huſbandry, however, ſtates the produce about Dartford, in the county of Kent, at about forty ſacks the acre, though he ſays fifty have ſometimes been gathered from that ſpace of land *.

But for the later crops that ſtand to ripen, it is ſuppoſed by ſome to be from three and a half to four quarters the acre; others however imagine the average of any two crops together not more than about twelve buſhels †. And that on the whole, if the value of the produce be merely attended to, it may be conſidered as a leſs profitable crop than moſt others. As a means of ameliorating and improving the ſoil, at the ſame time it is, however, to be eſteemed as of great value.

The greateſt danger to the early pea crops is to be apprehended when the weather during the more early ſpring months is hot and ſunny in the day-time, attended with ſharp froſts in the nights, as in this way great miſchief is often done, the crops becoming attacked with the mildew, and not ripening in a proper manner.

While the peas are proceeding in their growth, and ſtill more particularly at

* The produce and expence of cultivation of a field of ſix acres, in June, 1796, that was not at all remarkable for more than a common crop, are thus ſtated by Mr. Middleton in his Survey of the Agriculture of Middleſex:

Number, 40 ſacks, of four buſhels each, of pods ſent to market, and ſold from 6s. to 13s. average 7s. 6d. each			£. 15 0 0
Haulm, ſtacked, and given to draught horſes, one ton per acre, worth two-thirds as much as hay, but ſay only			3 0 0
Produce			£. 18 0 0
EXPENCES.—Ploughing once from clover ley	£. 0 10 0		
Seed, four buſhels, at 12s.	2 8 0		
Drilling, covering, &c.	0 7 0		
Hoeing twice	0 10 0		
Podding at 18d. per ſack, on 40	3 0 0		
Marketing, diſtance ten miles, land carriage	1 5 0		
		8 0 0	
Remains		£. 10 0 0	

† Donaldſon's Modern Agriculture.

the periods when they come into bloſſom and begin to ſet their pods, it is of great importance to have rather moiſt weather, as by that means the vegetation of the crop is promoted in a more perfect manner, and there is a greater chance of the peas being well podded. The chief ſigns of the healthy and vigorous vegetation of pea crops are thoſe of their leaves poſſeſſing a fine bloom of a bluiſh caſt, and having the outermoſt large leaves of the bloſſom extending backwards *.

In the late or general pea crops, after they are reaped or rather cut up by means of a hook, it is the uſual practice to put them up into ſmall heaps, termed *wads*, which are formed by ſetting ſmall parcels againſt each other, in order that they may be more perfectly dried both in the ſeed and ſtem, and be kept from being injured by the moiſture of the ground. But in the early crops the haulm is hooked up into looſe open heaps, which, as ſoon as they are perfectly dry, are removed from the ground and put into ſtacks for the purpoſe of being converted to the food of animals, on which they are ſaid to thrive nearly as well as on hay †. When intended for horſes, the beſt method would ſeem to be that of having them cut into chaff and mixed with their other food.

It is the practice in ſome diſtricts to remove the haulm as ſoon as it has been cut up, by hooks conſtructed with ſharp edges for the purpoſe, to every fifth ridge, or even into an adjoining graſs field, in order that it may be the better cured for uſe as cattle food, and at the ſame time allow of the land being immediately prepared for the ſucceeding crop. What are uſually termed winter peas, or ſuch crops as have been ſown in the autumn, generally afford the largeſt proportion of cattle fodder.

It is of conſiderable importance in the economy of a farm, when the nature of the ſoil is ſuitable, to have recourſe to the early ſorts; as by ſuch means the crops may in many caſes be cut and ſecured while there is leiſure, before the commencement of the wheat harveſt.

Where the nature of the ſoil is dry and warm, and the pea crop of a ſufficiently forward kind, it may be eaſy to obtain a crop of turnips from the ſame land in the ſame year. But in this view it is the beſt practice to put the crops in in the row method, and keep them perfectly clean by means of attentive hand and horſe hoeing; as in that way the land will be in ſuch a ſtate of preparation for the turnips, as only to require a ſlight ploughing, which may be done as faſt as the pea crop is removed, and the turnip ſeed harrowed in as quickly as poſſible upon the newly turned up earth. In ſome particular diſtricts a third

* Engliſh Encyclopædia, art. Huſbandry. † Corrected Report of Middleſex, p. 285.

crop is even put into the ſame land, the turnips being ſold off in the autumn and replaced by *collards*, for the purpoſe of greens in the following ſpring. This, according to Mr. Middleton, is the practice in ſome places in Middleſex.

It is a method of cultivation that can, however, only be attempted on the warm and fertile kinds of turnip ſoil, and where the pea crops are early; on the cold heavy and wet deſcriptions of land, it is obviouſly impracticable.

With the marrowfat and other late ſorts of peas, the uſual practice is to either prepare the land for wheat, or to put in crops of ſavoys or other late ſorts of cabbages, which are methods of huſbandry that may often be had recourſe to, even on the more heavy ſorts of land, with ſucceſs. From pea crops rendering the lands on which they are cultivated more light, open, and porous, they are ſuppoſed to be leſs proper for preceding wheat than thoſe of beans; on the more ſtiff ſorts of ground this cannot, however, be an objection of any great conſequence, and even on the lighter kinds it may often be obviated, by giving the ſeed earth early, ſo that the crop may be put in upon a ſtale furrow, by the uſe of the ſheep-fold, either immediately before or after the grain is depoſited in the ſoil, and by repeating the ſame practice occaſionally afterwards, as well as by rolling.

The portion of peas that is not conſumed as human food is moſtly appropriated to the purpoſes of fattening hogs and other ſorts of domeſtic animals; and, in particular inſtances, ſupplies the place of beans as the provender of labouring horſes; but care ſhould be taken, when uſed in this way, that they be ſufficiently dry, as, when given in their green ſtate, they are ſaid to be apt to produce the gripes.

Beans.—This is a ſpecies of crop that may be cultivated to much advantage on the more heavy wet kinds of land, which are improper for moſt other ſorts of crops, both on account of the utility of the produce, and the improvement that is effected in the nature of ſuch ſoils; as by this means, as has been already ſeen, the ground may in many caſes be rendered proper for the growth of wheat, without having recourſe, as has been uſually done, to the uneconomical practice of preparing it by a naked fallow.

There are different kinds of beans cultivated in different diſtricts, according to the intentions of the farmers, and the nature of the ſoils; but they may be ſufficiently diſtinguiſhed by dividing them into field and garden beans. Of the firſt ſort the common horſe-bean is the moſt generally cultivated on the ſtrong lands, as it is found to grow to a greater height in the ſtem, and of courſe to cover the ſurface of the land more effectually. The tick bean is, however, ſup-

poſed by ſome cultivators to afford a larger produce. The large ticks are the ſort moſtly grown in the county of Kent, where the bean huſbandry is practiſed to ſome extent; but in Eſſex, where the ſyſtem of cultivating beans alſo prevails in a conſiderable degree, the ſmall ticks are held in the higheſt eſtimation, as on the ſtrong lands of that diſtrict they are moſtly found to afford an abundant produce. And in the market this is the ſort of bean that generally fetches the beſt price.

Some of the latter or garden kinds have lately been introduced into the field with conſiderable advantage in particular diſtricts. Of theſe the mazagan and Mumford, the long-pod, and the Windſor, are the ſorts that are in general cultivated. The firſt is an early kind that does not grow to any great height, ſeldom more than about two feet. The ſtem is ſlender, but moſtly well beſet with pods, which contain beans of rather a ſmall ſize. This ſort of bean, from its not growing tall, and having but a ſlender ſtem, may probably be grown with profit on the leſs ſtrong and heavy ſorts of ground. It has alſo the property of becoming ripe more early than any of the other garden beans. The Mumford bean is alſo proper on the ſame ſort of land. But the long-pod is of a much taller growth, and conſiderably more ſtrength of ſtem; it conſequently requires greater depth and ſtrength of ſoil for its advantageous culture. It is a ſort of bean that affords a large produce where the land is ſuitable to its growth. The Windſor bean is of a ſtill larger kind than the long-pod, the ſeed approaching to ſomewhat the ſquare form. It grows ſtrong and tall like the long-pod kind, but ſeldom yields ſo large a produce. Theſe large kinds of beans are rarely, however, cultivated in the field, except in the vicinity of large towns, where they can be ſold in the pods green.

This is a ſort of crop that may be cultivated with ſucceſs, as has been ſeen, on almoſt any of the ſtronger kinds of moiſt ſoils. It thrives equally well in the ſtiff clayey lands, and thoſe of the ſtrong loamy kinds. The ſtaple of the lands, where bean crops ſucceed to the greateſt advantage, is generally of a good depth; as in ſuch the roots are enabled to get down ſo as to be capable of ſupplying themſelves with a ſuitable proportion of nouriſhment, which cannot be the caſe where the ground has a thin ſtaple.

Bean crops are grown after wheat and oats, as well as on ſuch lands as have been newly broken up from the ſtate of ley. On the laſt they may be cultivated with great propriety and advantage where danger is apprehended of corn crops being injured by the attacks of the grub or other inſects. And, beſides their utility in this way, they may be of great benefit in caſes where the ſward is tough, by breaking down and reducing the parts of the ſoil, as well as in

promoting the putrefaction and decay of the turfy or graſſy material, and the deſtruction of weeds, by the ſhade and ſmothering cloſeneſs which they produce on the ſurface of the ground. Though this ſort of crop is capable of being cultivated after moſt ſorts of vegetable productions, it ſeems probable, from its poſſeſſing a tap root, and ſtriking deeply into the earth, that it may be grown to the moſt benefit in ſucceſſion to ſuch ſorts of plants as are of the fibrous-rooted kind.

The common method of preparing the ſoil for the reception of bean crops is merely by giving one ploughing at the period when the ſeed is put into the ground in the ſpring months. But it is a better practice probably to plough the land into ridglets of about two feet ſix inches in width, as early as poſſible in the autumn, after the manure has been applied, which ſhould conſtantly be laid on when beans are ſown after grain crops; in which ſtate it ſhould remain until the period at which the beans are to be put in. By the uſe of a portion of manure in this manner, the crops are rendered more ſtrong and vigorous in their growth, at the ſame time that the branching of their lateral ſhoots is conſiderably promoted.

By this method of ridging up the land in the autumn, and manuring it, on the moiſt kinds of heavy ſoils much advantage is produced. This form of ridge preſerves the ground dry, and in a healthy condition, during the winter months, and at the ſame time prevents the manure that is included in the middle of them from being diſſolved and waſhed away by heavy rains; and, in addition, the land is kept in ſo dry a ſtate at the ſeed-time, as to afford the cultivator an opportunity of putting in the beans whenever the weather is fair *.

Where the drill culture is practiſed, more frequent ploughings will be requiſite, in order that the land may be brought into ſuch a ſtate of tilth as that the drill machine may diſtribute the ſeed with uniformity.

Time of ſowing.—The ſeaſon of putting this crop into the ground muſt depend in ſome meaſure upon the nature of the climate and ſituation. In the more mild and leſs expoſed places in the ſouthern diſtricts, they may be put into the earth with propriety during the whole of the month of January; and in ſuch as are more expoſed, as early in February as the buſineſs can be accompliſhed with propriety. But in the more northern parts of the kingdom, a later period may be more ſuitable, as in March. When the period of planting is delayed too long, there may often be danger of the crops not being ſufficiently

* Corrected Report of Middleſex.

eſtabliſhed in the ſoil before the weather becomes too hot and parching. And, on the contrary, when they are ſet too early there may be danger from the froſts, which, when ſevere, are known to injure them greatly at the time they firſt ſhew themſelves above the ſurface of the ground, and when accompanied by ſudden thaws to be capable of wholly deſtroying them *.

Seed.—The proportion of ſeed that may be neceſſary, muſt, of courſe, be different, according to the nature of the ſoil, the period of putting the crop into the ground, and the manner in which the buſineſs is performed. Where the broadcaſt method is purſued, and the land is of the medium bean kind, from three and a half to four buſhels is the quantity that is moſt commonly allowed to the acre. This mode of practice ſhould, however, never be attempted when the others can be had recourſe to. Under other methods of putting in the beans, a much leſs proportion of ſeed is, however, required, the quantity varying according to the diſtance of planting from two to three buſhels and a half to the acre, or in ſome caſes perhaps rather more. When planted in rows at the diſtance of two and a half feet, the quantity of ſeed that is moſt proper has been found to be about two buſhels to the acre; but when put in rows at the diſtance of only fifteen inches, it will be three and a half buſhels, or perhaps rather more †.

The manner of putting this crop into the ſoil differs conſiderably in different diſtricts. In ſome the method of ſowing broadcaſt is ſtill in uſe; but in this the ſeed is liable to be left uncovered on the ſurface of the land, or covered ſo lightly that the bean plants are incapable of vegetating in a proper manner, from which the crop often becomes weak and feeble in its early growth, and ſeldom acquires proper ſtrength afterwards. Beſides, in this method, from the irregularity of the crop, there is great danger of its being injured by the growth of weeds, as they cannot be conveniently deſtroyed by the hoe.

It is the cuſtom in ſome of the more ſouthern diſtricts to plant this kind of crop in rows, by means of a line and dibble, which, though an expenſive practice, is greatly preferable to the above, both in admitting of the land being kept clean, and in the economy of ſeed. In this way the rows are uſually marked out to the diſtance of a foot from each other, and the beans depoſited in holes about two inches apart, the lines being ſtretched acroſs the ridges, which are formed of different breadths, according to the circumſtances of the land, but in many caſes about ſix feet over. In this mode, after one row is

* Corrected Report of Middleſex. † Ibid.

planted, the pegs to which the lines are attached are moved exactly to the distance that is requisite until the whole field is finished. The expence of this mode of setting beans is generally about nine pence or a shilling the peck. In some places it is done by the gallon at the rate of about four pence. In performing this business care must constantly be taken by the employer to see that the beans are regularly deposited in the holes, and not thrown away or otherwise wasted, in order to obtain greater wages. After the beans are thus deposited, a bush-harrow, drawn by horses in the furrows, is generally passed over the ground in order to cover them. The Kentish farmers have however a much neater and more expeditious method of sowing beans, which is, to strike out furrows in the proportion of about eleven to a rod in breadth, in which the seed is thinly deposited by means of a sowing-box, which is held by a person following the striking plough, and who, by slightly agitating it when filled with beans, drops them with regularity into the furrows as they are formed. The seed is then covered by harrowing down the inequalities of the ground. It is stated that in this method, with two men and two or three horses to the plough, a person to manage the box, and a boy with two horses to perform the business of harrowing, the space of three acres may be completed in the course of a day *.

In accomplishing this business, it is, however, the custom of some agricultors to make use of a drill plough; but as beans are liable to considerable inequality of size, they are seldom delivered in a sufficiently regular manner from the hopper, large beans occasionally interrupting the sowing in such a way as to render the crop vacant or uneven in different places, defects which the picking of the seed over is not even capable of removing. In speaking of Implements, drills have however been described that seem to deposit the beans with much correctness.

In the sowing of this sort of crop, experiment has shewn that, on the poor and more moist kinds of loamy soils broken up from the state of ley, it may frequently be more advantageous to put the beans into the ground in rows at nine inches, or on every furrow, than at eighteen inches or every other furrow, though on rich fertile tillage lands the latter may often be the most proper, or even still larger distances in some cases †.

From the nature of the root of the bean plant, it has been inferred, that it should constantly be planted to a good depth in the soil, not less than five or six inches below the settled surface of the land, as by the lateral fibres which con-

* Synopsis of Husbandry, p. 110. † Young's Annals of Agriculture, vol. VII. p. 204.

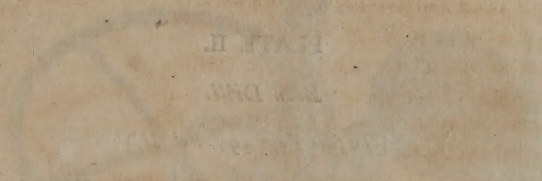
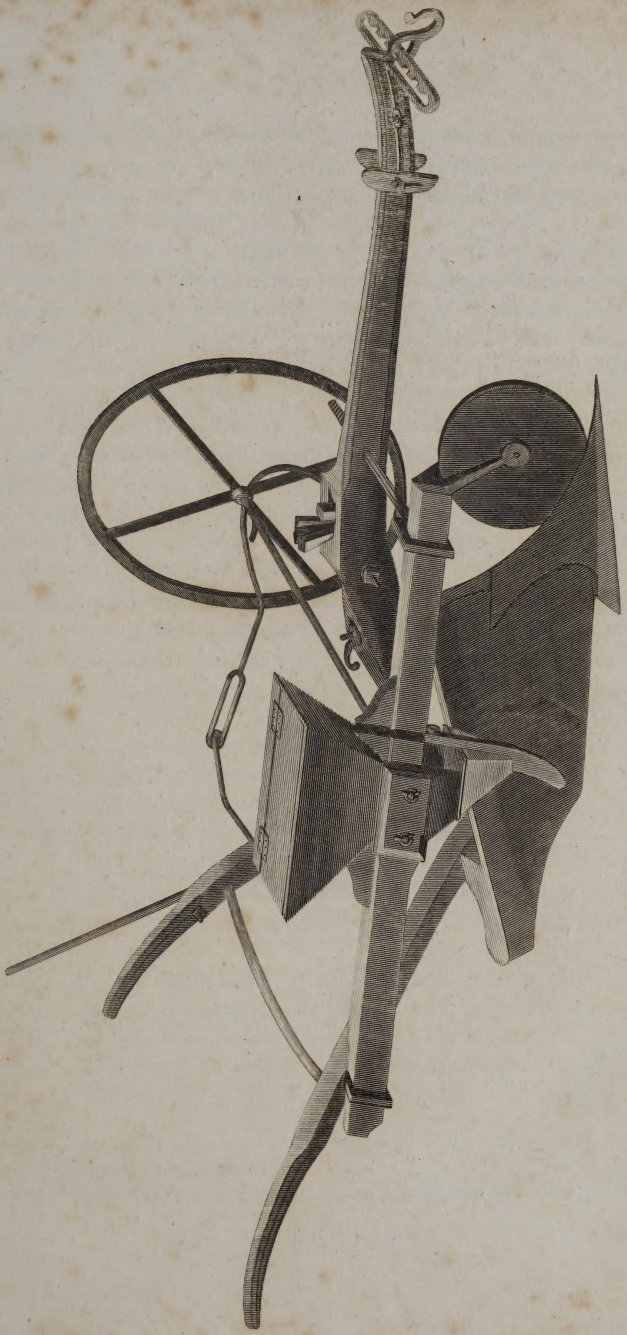


PLATE II.

Bean Drill.

[*To face Page* 594, *Vol. II.*]

THIS drill is the invention of Mr. Amos, and which Mr. Young has recommended as having much merit. It delivers the beans in a different manner from many others, as it ſcatters the ſeed on the ſlice of the preceding furrow, while they moſtly drop it into the furrow. It has been extenſively employed by the inventor; and on wet lands muſt be highly uſeful, by depoſiting the ſeed while the land is ploughing, and thereby preventing the neceſſity of going a ſecond time upon it, which is often injurious.



ſtantly paſs off from the portion of root above the ſeed to the upper part of the ground, large ſupplies of nouriſhment may be conveyed to the plants, which could not be the caſe when put in more ſuperficially, as that part of the root below the ſeed is not furniſhed with ſuch fibres*.

The putting in of this kind of ſeed by the drill is a practice that may be performed with the moſt benefit and ſucceſs on the drier and more mellow kinds of bean lands that have been ſome time in a ſtate of cultivation; but on the wet and ſtrong grounds it is frequently a difficult and troubleſome proceſs: it is therefore probably a better method to dibble them in upon the ſeed earth, eſpecially in breaking them up from a ley, as where they have been previouſly ploughed, early tillage in the ſpring, however neceſſary, is impoſſible, it being only capable of being accompliſhed on a ley. In theſe caſes a row may be put in by the dibble on every ſecond furrow, by which they will be equidiſtant eighteen inches, or by dibbling two furrows together and miſſing one they will be in double rows at nine inches, with intervals of eighteen, which is equal to one row at every thirteen and a half inches †.

After-culture.—Where the broadcaſt method of putting in the crop prevails, little or no advantage can be afforded to it afterwards, which is a circumſtance that renders that practice improper in moſt caſes, as few crops derive more benefit from after-management than thoſe of beans. In ſome inſtances, indeed, the large weeds are removed by a hoe or hook, and in others ſheep have been turned in for the ſame purpoſe, as from their diſlike to the bean plant they are ſaid not to injure the crop either by eating the young plants or breaking them off ‡. The practice is however too hazardous to be attempted except in particular caſes. But where the crop is planted in rows, either by the drill, dibble, or other methods, the ground admits of being frequently ſtirred and laid to the roots of the plants by the hand or horſe hoe, and of being kept perfectly clean by weeding; upon the proper performance of all which the perfection of the bean huſbandry conſiſts.

It has indeed been well obſerved by a correct and attentive cultivator, that theſe different operations are abſolutely eſſential, and that where a wheat crop is to follow, the more money there is beſtowed in this way, the better it is for the farmer; thoſe of Kent being diſſatisfied if it does not amount to from ſeventeen to twenty ſhillings the acre, as their wheat crop is ſure to ſuffer where

* Vancouver, in Annals of Agriculture, vol. XXV. p. 65.

† Young's Corrected Report of Lincolnſhire.

‡ Muſæum Ruſticum, vol. III.; Synopſis of Huſbandry; and Modern Agriculture.

there has been any neglect in these processes, beans well managed by the hoe being an excellent preparation for wheat crops *.

In the methods of planting in rows, at the distances of fifteen or twenty-four, as well as on ridges at thirty inches, the horse-hoe may be most conveniently employed, but for narrower spaces the hand-hoe can only be made use of. The practice in Middlesex is, when the crops are about five or six inches high, to constantly hand-hoe the intervals, and clean the rows by weeding, and to repeat the same operations about the time of their coming into blossom, in which the earth should be carefully brought up to the roots of the plants, which has much effect, by the quantity of nourishment thus provided, in promoting the setting as well as filling of the pods. It has also been remarked, that, where the ground is in a situation to admit of the action of a small light plough, or a horse-hoe, to earth up the rows, great benefit may be thus produced, but that on the clayey loams this is only capable of being performed for a little time after they have been well moistened with rain †.

In the county of Kent it is frequently the custom to apply the roller and the harrow to the bean crops about the middle or latter end of March, by the first of which the cloddy parts are broken down and reduced, while the latter immediately following renders the baked surface-mold fine and powdery, by which means new supplies of nourishment are provided, and the advancement of the young plants greatly promoted. At no distant period after this the beans are edge-hoed, and then braked, the latter of which is a method of practice chiefly confined to that district, and which is considered by some cultivators as much preferable to the application of the hoe to the whole surface of the spaces between the rows, not only as being performed at a much less expence, but on account of its being more effectual in the removal of weeds, and providing more abundant supplies of such substances as contribute to the nutrition of plants, by loosening and newly aerating the surface-mold of the soil, as well as throwing it up to the roots of the beans. It is customary in many parts to repeat this process every fortnight or three weeks, from the early part of May till the season at which the crop blooms ‡. And it is observed, that the earthing up may be accomplished with facility by the above implement, merely by fixing a small piece of wood on the *strig* of it, the diameter of which regulates the height of earthing up the stems of the beans as they advance in growth ‖.

* Young's Corrected Report of Lincolnshire.

† Corrected Report of Middlesex.

‡ Annals of Agriculture, vol. IX.

‖ Synopsis of Husbandry.

In other bean diſtricts, as in Berkſhire, where they ſow triple rows at eight or nine inches, and leave intervals of two furrows width, it is the practice to plough two furrows up each interval from the beans, making a ridge in the middle, by a ſmall light plough contrived for the purpoſe, which is drawn by one horſe, a moiſt ſeaſon being choſen for the buſineſs. After this the ridges are to be harrowed by means of a triangular harrow, by which the ſuperficial parts of the ſoil are rendered light and mellow, ſo as to admit the lateral fibres to ſhoot in it with facility, and draw forth ſupport for the crop more effectually.

The manuring of the land is found from actual trials to be of very great advantage in the culture of this ſort of crop; as even a very ſmall portion of it, as from thirty to forty loads, of about eighteen buſhels each, has been found of ſervice both in promoting the crop and preventing the beans from becoming what is termed *roſe-headed* *. It has likewiſe been found, that by preparing the ridges in the manner that has been deſcribed above, and including manure in the middle of them, the ſeed may be put in much ſooner than when they are flat and broad; and that by the uſe of the horſe-hoe, the plants tiller more, the crops are forwarder, and ſubject to leſs injury from the attacks of inſects †.

In ſome diſtricts it is the practice to ſow beans and peas together, or what is termed *blendings*; but this is moſtly an improper method, as plants of different ſorts never ripen well or equally together.

In ſuch ſummers as are dry, beans are frequently liable to be much injured by the attacks of the black fly, or what is often termed the *dolphin*, the whole field in particular caſes being in danger of being deſtroyed in the courſe of a few days. In order to prevent this miſchief, it is the practice in ſome places to cut off the tops by means of a ſcythe or other ſharp implement, as it is moſtly on the tops of the plants that the inſect firſt appears. When this method is adopted, it ſhould be performed on the very firſt appearance of the fly, otherwiſe little benefit can be produced; as perhaps by removing the firſt inſects that ſhew themſelves, their propagation may in ſome degree be prevented.

The blight likewiſe ſometimes proves deſtructive to the bean crops about June or July, when the weather is hot and foggy in the day with cold nights. In this caſe the bloſſoms fall off, and no pods are formed. But though much injury may often be done in this way, the crops ſometimes turn out better than was expected; they ſhould not therefore be given up too haſtily.

The ripening of the beans is ſhewn by the *pods* or *kids* turning of a black co-

* Annals of Agriculture, vol. IX.

† Corrected Report of Middleſex.

lour, which moſtly happens about the latter end of Auguſt, after which they begin to open at the ends; but they ſhould always be cut or drawn up a week or ten days before this would happen, for though in ſome parts of the crop the kids may not be perfectly turned, this ſhould not delay the buſineſs, as they will become ripe and hard after being cut or drawn up by the roots, by ſetting the ſheaves upright, and leaving them expoſed to the influence of the ſun and air for ſeven or eight days. When cut or drawn up ſome time before they are in a ſuitable ſtate of maturation, they ſhrink and become wrinkled; and if it be done when they are too ripe, they are liable to be loſt by being ſhed in the field: it is a better practice, however, to reap them before they are fully ripe, than to let them ſtand until they are over-maturated. When they have become too much ripened, it is recommended to cut or draw them up while the dew is upon them, and to convey them in the ſame ſtate to the ſtack. The parts of the crop that are not ſo perfectly ripened may be cut or pulled during the dry part of the day.

When the ſeaſon is moiſt, and the land of a good quality, bean crops continue to proceed in their growth to a late period, and the pods formed on the upper parts of the ſtems remain green when thoſe on the lower parts are in a perfectly ripe ſtate. In ſuch caſes it is not neceſſary to delay the buſineſs of removing the crop, as by their remaining a little longer in the field no injury will be done either in the ſtack or to the ſample. Indeed, as this ſort of vegetable is extremely ſucculent, it is proper in moſt caſes to let it remain out after being cut for a conſiderable length of time, in order that the exceſſive moiſture may be fully diſſipated, otherwiſe the ſample may ſuſtain great injury from moldineſs, and taking on too great a heat in the ſtack. It may alſo on theſe accounts be neceſſary for them to remain in the ſtack for ſome time before they are threſhed out.

There are different methods of removing this ſort of crop from the land: in ſome diſtricts it is the practice to reap or cut it cloſe to the ground with a ſharp hook contrived for the purpoſe; in others it is mown; and in a few it is pulled up by the roots, being afterwards bound up into pretty large ſheaves by woollen yarn, old ropes, tarred cord or ſtraw ropes, and ſet up three or four together.

In caſes where wheat, tares, or other ſimilar crops, are to be ſown after beans, they ſhould be ſet up in ſuch a manner as to cover as little ground as poſſible, in order that the cleared ground may immediately undergo a ſuitable preparation for ſuch ſucceeding crops.

The quantity of produce of beans is different according to the nature of the ſoil, the kind of ſeed, the method of planting, and the exactneſs with which the after-culture of the crop is conducted. In Middleſex it is ſtated to be from three and a half to four quarters the acre. And in Yorkſhire, when cultivated as a preparation for wheat, from four to ſix quarters the acre; but where the crop precedes a fallow, only from two to three quarters. In other diſtricts, as in Kent, where the bean huſbandry is more perfect, the common tick beans are ſaid to afford from two to ſix quarters, according to circumſtances; the mazagan, and other ſmall beans of the ſame ſort, from three to five quarters, and ſometimes conſiderably more; and the Windſor, long-pod, and other large ſorts of beans, from three or four to ten quarters the acre *. Taking it throughout the whole kingdom, it is aſſerted by an able writer to vary from ſixteen to forty buſhels the acre, but that a good average crop can ſeldom be ſtated at more than twenty †.

The ſtraw of this crop is uſeful for various purpoſes. When well broken by threſhing, it forms a durable litter for working horſes, as well as hogs and other animals. It is alſo aſſerted to be a hearty and nutritious food for cattle during the winter ſeaſon; and that both oxen and horſes, when not wrought, thrive well upon it. And as the reduced parts, or what is termed the *caving-chaff*, have been found valuable as a manger food for the labouring teams when blended with other ſubſtances, it is probable that in particular caſes the ſtems might be cut into chaff with advantage. But when made uſe of in theſe methods, it ſhould be taken as freſh as poſſible from the flail.

The ſmaller kinds of beans are principally employed in the feeding of horſes, hogs, and other animals; and as they contain a third more meal in a given portion than oats, and at the ſame time probably afford a more durable nouriſhment, it muſt be economical to make uſe of them in the feeding of labouring horſes. And on the ſame principles they muſt be advantageous when uſed in the fattening of cattle, &c. But when hogs are fed with this ſort of food, it is aſſerted that the pork is indifferent from the meat becoming hard, though for bacon it is extremely good.

Where the beans are to prepare the land for wheat, it is eſſentially neceſſary that the ſtubble, with ſuch weeds as may have been left, ſhould be removed as expeditiouſly as poſſible after the beans are taken off. This purpoſe is well

* Corrected Reports of Middleſex, North Riding Yorkſhire, and Kent.

† Donaldſon's Modern Agriculture, vol. II.

accompliſhed in ſome bean diſtricts, and at the ſame time a great degree of pulveriſation effected, by *ſpuddling* the land with a kind of plough, to the ſhare of which an iron plate is attached croſsways, at the diſtance of about four or five inches from the point, the ſame axle-tree and wheels being employed as were uſed in ſtriking the furrows. By this implement, with two horſes and a man, it is aſſerted three acres of land may be finiſhed in a day, by ſetting the point of the ſhare in the intervals in ſuch a manner as that the plate or fin may extend to a row on each ſide. After this operation has been performed, by paſſing the harrows and the roller over the land, the whole is cleared with little expence, and left ready for the ſeed earth *. On the more thin and light kinds of ſoils, whether of the chalky or gravelly ſort, ſuch a proceſs may, however, be improper, as ſuch lands may be rendered too open and porous for wheat crops by it.

Potatoes.—The cultivation of this highly valuable vegetable has rapidly increaſed within theſe laſt twenty years, ſo that it may now be conſidered as ſtanding next to wheat in reſpect to human food.

Though the varieties of this plant that are cultivated are extremely numerous on account of their being raiſed continually from ſeed, there does not appear to be more than two diſtinct ſpecies; the *red-rooted*, or that which bears a purple bloſſom or flower, and the *white-rooted*, or that which has a white flower.

It is ſuggeſted by an intelligent practical writer, that much ſtill remains to be performed in reſpect to the improvement of the quality and productiveneſs of this plant, by raiſing it from ſeed. The farmers in Yorkſhire, it is obſerved, adopt this method. "In autumn when the apples are beginning to fall ſpontaneouſly, they are gathered by hand, and preſerved among ſand until the ſpring, when they are maſhed among the ſand, or among freſh mold, ſeparating the ſeeds, and mixing them evenly with the mold. So ſoon as the ſpring froſts are judged to be over, they are ſown in fine garden mold; and as faſt as the plants get into rough leaf, and are ſtrong enough to be handled without injury, they are tranſplanted into another bed of freſh mold in rows, which are kept clean during ſummer. In autumn, bunches of ſmall potatoes are found at the roots of theſe plants, varying in ſize, the firſt year from an hazel nut to that of a crab apple. Theſe being planted in the ſucceeding ſpring, produce potatoes of the middle ſize; but they do not arrive at their full bulk until the third or fourth year. When the uſe of the ſtove or the garden frame can be procured, this proceſs may be ſhortened; the ſeeds being ſown within theſe early in the ſpring,

* Synopſis of Huſbandry.

the plants will be fit to be planted out as ſoon as the froſts are gone, by which means the ſize of the roots will be much increaſed the firſt year, and will, in the ſecond year, riſe nearly to perfection*." It is alſo added, that, in ſelecting proper plants from ſeedling potatoes, two circumſtances are neceſſary to be attended to; which are, the quality of the potatoe, and its productiveneſs. In caſes where theſe different properties are combined in the ſame plant, there can be no difficulty in deciding in its favour.

The varieties of this root, that are at preſent in cultivation in different parts of the kingdom, are extremely numerous. In Lancaſhire, where the potatoe huſbandry is well underſtood and largely practiſed, there are, according to the account of Mr. Kirkpatrick, upwards of twenty ſorts of the more early kinds, and more than half as many of thoſe of the late†.

The *old winter red* is an excellent variety for the table in the ſpring, when moſt other ſorts have loſt their flavour, and are become unfit for uſe by ſprouting. It is ſaid likewiſe to have the property of not being liable to the curl.

The *blacks* are likewiſe a late ſort, which keep well till about Auguſt.

* Donaldſon's Modern Agriculture, vol. II.

† Theſe different varieties are thus denominated in his tract on the culture of the potatoe.

Early kinds.

Smooth yellows,	Mather's ſeedlings,
Red champions,	Kerkham marbles,
White ditto,	Donbobin's ſeedlings,
Lady queens,	Poor man's profit,
Drunken landlord,	Golden gulleons,
Birchal's golden yellows,	Invincible,
Smith's ſeedlings,	Broughton's dwarfs,
Foxe's ditto,	Hatley's noneſuch,
Boſkow's kidneys,	Early perrins,
Engliſh champions,	Forcing dwarfs,
Britton's dwarfs,	Early Manleys.
Bates's ditto,	

Late kinds.

American white rangers,	Ox noble,
Ditto red ditto,	Lords,
Derbyſhire reds,	Seedling varieties,
Late champions,	Balmer's ſeedlings,
Ditto kidneys,	Budworth's duſters,
Pink eyes,	Iriſh apples,
Pink-noſed kidneys,	Winter kidneys.

As cattle potatoes, the *ox noble* and the *cluſter* are the varieties principally cultivated, as they are both large in ſize and very productive.

The *white* and *apple* ſorts are however moſt proper for being made uſe of in the early part of the ſeaſon. And the *pink-eyes* and *copper-plates* are of a hardy nature, and probably capable of being grown with leſs perfect culture than moſt of the other varieties. But though a number of trials have been made in order to determine the differences in the productiveneſs of the different varieties, yet from the effects which the differences of ſoil, climate, culture, and other cauſes produce, the matter has not been decided with much correctneſs *. The *royal* or *Cumberland early* is very productive and of a large ſize, with a good flavour, and beſides, it ripens early.

The ſoil in which this root is capable of being produced to the greateſt advantage is a rich loam of the light ſandy kind, that poſſeſſes a medium degree of moiſture. They may, however, be grown with ſucceſs on lands that are

* The products in the experiments of Mr. Young, with the three following ſorts, under the ſame management, in the drill method, were theſe:

Kinds.	*Produce.*
Cluſter	360 buſhels.
Red-noſed kidney	144
Golden tags	207

And the reſults of Mr. Baker's trials in Ireland, in comparing different ſorts, are thus ſtated:

Sorts.	*Produce.*
Commonwiſe	21 lb. 6 oz.
Apple	20 2
Red French	15 12
Munſter white	16 0
Crones	16 6
Spaniſh	15 10

On repeating the experiment, the reſult was:

Sorts.	*Produce.*
Black	111 barrels per acre.
Quakerwiſe	108
Red French	88
White ditto	85
Commonwiſe	103
Apple	76
Engliſh white	83
White Munſter	79
Spaniſh	70
Crones	60

much ſtronger, where proper attention is beſtowed in their culture. On grounds of the peat-moſs kind they have likewiſe been found to ſucceed in a high degree. In Mr. Townley's experiments, though the more ſtiff and tenacious ſorts of lands do not ſeem to have been tried, the produce appears to have been the largeſt on the ſtrong kinds of ſoil; but, in every caſe, it is eſſential that they be dry, the ſtagnation of moiſture being highly detrimental to the growth of this root *.

The potatoe, though it is found to ſucceed to advantage in the more open and porous ſorts of land, is not well ſuited to thoſe of the perfectly ſandy kinds, as they ſeldom retain a ſufficient degree of moiſture to enable the tubrous roots of the plants to ſwell out and become of a good ſize, nor is there, in general, a ſufficient proportion of vegetable mold in ſuch ſoils to promote the moſt perfect growth of the crop. It is only in ſuch as poſſeſs a conſiderable degree of lightneſs and good carbonic earthy matter, that they are enabled to propagate their ſubterraneous wires or root-buds, become fully diſtended, and attain their utmoſt ſize and increaſe.

This is fully ſhewn by the experiments of Mr. Somerville, in cultivating potatoes with good earth alone inſtead of manure; as, where that was employed, the produce was much more abundant than in other caſes †.

In order that this ſtate or condition of the ground may prevail in as high a degree as the nature of the land will admit, it may be the moſt advantageous practice in the field culture of this plant to put in crops of this kind in the more heavy adheſive ſoils, after bean, cabbage, or other vegetables of the ſame nature, that require manure; and in thoſe of the more light deſcriptions, after peas, ſuch grain crops as demand a fineneſs of tilth, and on ſuch lands as are under the ſtate of fallow.

It is a practice in ſome diſtricts to raiſe potatoes on the *ley* grounds when firſt broken up; but this can ſeldom be an advantageous method, except where they are planted in what is termed the *lazy bed* manner, or by the dibble in the middle of the furrow ſlice, in which, from the large quantity of looſe mold by which the ſets are covered, good crops may be produced, as is often the caſe

* The reſults on planting four eyes of the cluſter potatoe, on four different ſorts of ſoil, were theſe:

Kind of Soil.	*Produce.*
On a ſtrong rich loam	34 lb.
On a light rich loam	29
On a good gravel	19
On a ſand	15

† Report of the Board of Agriculture.

in Lancaſhire, where this mode of planting was formerly much in uſe. It has likewiſe been ſuggeſted, that potatoes may be grown in a very beneficial manner on ſward lands, by ploughing them very thin, and putting the ſets in under furrow *. And in theſe caſes Mr. Somerville adviſes, that a plough be made uſe of that only juſt pares off the ſward, and depoſits it flat in the bottom of the furrow, the root ſide uppermoſt; the ſets being placed by the planter on the inverted ſod immediately after this plough, and then covered with the fine mold from below by a common plough.

But whatever may be the nature of the ſoil on which the potatoe is planted, it ſhould be reduced by the operation of the plough, ſpade, or harrow, into as fine and mellow a condition as poſſible, in order that the earth may lie ſo light and porous as to admit of the proper ſwelling of its knobby roots. In moſt diſtricts where this root is much cultivated it is the cuſtom to give the land that is intended for this crop one or two ploughings in the latter part of the autumn, and, after it has been thus expoſed to the influence of the atmoſphere during the winter, in the ſpring at the time of planting to reduce the cloddy ſurface well by means of harrowing, after which the ground will be in a ſuitable condition for receiving the ſets. On the marſh lands in the Weſt Riding of Yorkſhire, where the cultivation of the potatoe in the field is carried on to a conſiderable extent, the lands that are intended to be cropped with this root, whether the preceding crops have been wheat, beans, or oats, are ploughed up at Chriſtmas, or as ſoon after as the work can be done; and in the middle of April, if the ſoil has become ſufficiently dry, it is harrowed well at intervals, occaſionally uſing the roller, until the whole has been brought into a perfectly fine ſtate. After this the land is to be ridged up, in order to be planted.

As the potatoe forms its produce below the ground, and is of very luxuriant growth as well as conſiderable increaſe, it can but in few caſes be cultivated to advantage without the aſſiſtance of manure. And as it requires that the ſoil ſhould be kept free from the ſtagnation of moiſture, as well as light and open, it may be the moſt advantageous method to make uſe of the ſtable kind in its long or more littery condition, as by this means the ground, eſpecially when of the wet kind, may be kept more light and open, as well as more free from injurious moiſture, and at the ſame time a more durable ſupply of nouriſhment be provided for the crop, by its more gradual decay. Where this ſort of manure cannot be provided in ſufficient quantity, old thatch, the ſtrawy litter from the fold-yard, or any ſimilar material, may be employed.

* Experienced Farmer, vol. I.

But in the light ſorts of ſoil, dung in its more putrid reduced condition may be made uſe of with much propriety, as in ſuch caſes the mold is moſtly in a ſufficiently porous and open ſtate, and they have rarely too much moiſture remaining upon them. A great variety of different ſorts of manure have been tried by experimenters in the culture of the potatoe; but thoſe which have been juſt deſcribed ſeem to be the beſt adapted to the crop *. Mr. Billingſly, how-

* The following comparative ſtatement of the effects of different kinds of manure in the culture of this valuable root, has been given in a very able Report on the Cultivation of the Potatoe, drawn up by a committee of the Board of Agriculture.

	Manure per Acre.	*Crop: Buſhels.*
Experiment, No. I.	53 Loads (cubical yards) farm-yard dung	400
	160 Buſhels, ſoot	360
	160 Ditto, wood-aſhes	240
	32 Loads of dung	280
	42 Ditto	360
	No manure	180
Experiment, No. II.	32 Loads of dung, and 40 buſhels of wood-aſhes	400
	No manure	280
	160 Buſhels of ſlaked lime	380
	1½ Ton of barley ſtraw	300
	340 Buſhels of pot-aſh	380
	32 Loads of dung	400
	32 Ditto, and 160lb. ſalt added at time of ſpreading	400
	32 Ditto, and 160 buſhels lime	480
	32 Ditto, and 480 gallons urine	520

In Mr. Young's trials, the reſults were theſe:

	First Year.	*Second Year.*
No. 1. No manure,	produced 120 buſhels per acre,	140
2. Night-ſoil, 10 waggon loads	600	640
3. Ditto, 6 ditto	650	500
4. Ditto, 2 ditto	500	300
5. Bones, 10 ditto	650	640
6. Ditto, 6 ditto	640	560
7. Ditto, 2 ditto	560	240
8. Hog dung, 60 one-horſe cart loads	480	300
9. Ditto, 30 ditto	480	160
10. Yards compoſt 60 ditto	300	240
11. Ditto, 120 ditto	480	300
12. Ditto 30 ditto	140	140

In

ever, ſeems to recommend *well-rotted* horſe-dung, though the long dung is noticed as being the next in value *. The nature of the ſoil in which this was the caſe is not diſtinctly mentioned; it was probably of the ſandy kind, in which there can be little doubt but that horſe-dung, in a highly reduced ſtate, would be of the moſt benefit, as a larger proportion of carbonaceous earthy matter would thereby be immediately provided for the growth of the crop, and the ground be more preſerved from becoming too dry, light, or porous.

The dung of hogs has alſo been found, by the experiments of the ſame cultivators, to be nearly equal to that of the horſe, in raiſing crops of this highly valuable root.

When this ſort of crop is cultivated on the ſtiff and more heavy deſcriptions

In Lancaſhire, Mr. Townley, on comparing different deſcriptions of manures, found that

Manures.	*Produce.*
No. 1. Coal aſhes only,	produced 211lb., rather ſmall.
2. Stable dung and coal aſhes mixed	344, very fine.
3. Stable dung alone	315, ditto.
4. No manure	134, very ſmall.
5. Compoſt, dung lime, and ſoil	204, middling.
6. Stable dung covered with common yellow maſs	438, remarkably fine.
7. Soaper's waſte	383, very fine.
8. Stable dung and lime	268, tolerable.
9. Lime alone	187, ditto.
10. Coal aſhes and lime	19, ditto.
11. Stable dung and ſoaper's waſte	298, very good.
12. Soot, ſoil, and coal aſhes	271, ditto.
13. Salt and ſoil	200, ditto.
14. Saw-duſt and coal aſhes	190, ſmaller.
15. Stable dung and ſaw-duſt	307, very fine.
16. Dung of poultry and coal aſhes	236, pretty fine.
17. Dung of poultry and ſand	156, rather ſmall.
18. Saw-duſt and lime	197, ditto.
19. Decayed ruſhes and lime	208, very good.
20. Tanner's bark and lime	76, very poor.
21. Bark and ſtable dung	141, rather larger.
22. Bark alone	35, very poor.
23. Stable dung and lime ſpread over the land	230, pretty fine.
24. Chopped whins, with a covering of lime over them	256, very fine.

In theſe trials the manure was placed in furrows of five-feet lands.

* Billingſly's Report of Somerſetſhire; and Wimpey, in Bath Papers, vol. VI.

of loamy ſoils, on the principle of keeping the earth light and open by their very gradual decay, in order that the roots may have room to extend themſelves, many other ſubſtances beſides littery dung have been employed. Wheat ſtraw, furz, broom, heath, and other ſimilar matters, after having been in ſome meaſure reduced by chopping, are depoſited in the drills, and, from their gradual decay, good crops are frequently produced.

Clover, tares, vetches, and other ſucculent vegetable productions, when encloſed in the ſoil in their green ſtate, at the time of planting, have alſo been found uſeful as manure in the growing of crops of this kind *.

Peaty or turfy materials have likewiſe been made uſe of for the ſame purpoſe on different ſorts of land. On the light, thin, and open ſoils, they are aſſerted to have good effects, in contributing to the nouriſhment and ſupport of the crop, in rendering them more capable of retaining moiſture, and by increaſing their ſtaple. And in the heavier ſoils they become of much uſe, by keeping them in a more open condition, and thereby allowing the moiſture to paſs off more readily, and the roots of the plants to ſwell out in a proper manner. It is probable likewiſe that freſh vegetable earth, and decayed leaves collected from woods or other places, may be of ſervice in this way, as well as in the manner that has been mentioned above.

The trials that have been made with lime render it probable that it may be uſefully employed in the cultivation of the potatoe on the ſtiffer ſorts of ſoils, when combined in a ſmall proportion with rich earth and dung; but, in its ſimple ſtate, according to the experiments of Mr. Somerville, it has a tendency to induce the *curl;* and in the garden culture of this root, we have conſtantly found it diſadvantageous by producing the *canker,* whether employed in the *effete* or ſtate of *carbonat,* or in its more active or *cauſtic* one.

But though lime in its uncombined ſtate may not be capable of being made uſe of with much utility; where the practice of paring and burning is had recourſe to, and there is a conſiderable portion of aſhes from the combuſtion of the ſward and the coarſe vegetable products upon it, full crops of potatoes may be raiſed by the uſe of the aſhes alone. In this way, the coarſe unproductive paſture grounds in various parts of the kingdom, and extenſive tracts of uſeleſs waſte lands, may be brought into a ſtate of cultivation in an eaſy and profitable manner; as after a crop of potatoes, put in in this method, the land will, in moſt inſtances, be in a proper condition for the growing of grain crops.

* Billingſly, in Bath Papers, vol. VI.

On the ſea coaſts, in the northern parts of the iſland, ſea-weed is ſaid to have been found uſeful in the growth of the potatoe *.

Whatever ſort of manure may be made uſe of in the growth of potatoes, it is neceſſary that the quantity be fully ſufficient for the purpoſe of providing not only a ſuitable bed for the eſtabliſhment of the roots of the plants, but alſo for affording a due ſupply of nouriſhment during the whole time of their growth, as upon theſe circumſtances the ſucceſs of the crop ſeems in a great meaſure to depend.

After a very full and extenſive experience in the cultivation of this vegetable, an able and intelligent agricultor adviſes, that not leſs than twenty cart-loads, of thirty buſhels each, ſhould be applied, as the richer the ground the more abundant the crop; and that, however ſtrong the ſoil may be, the farmer ſhould not depend upon it to the excluſion of manure †.

Where the ſets are put in in the drill method, the manure ſhould be depoſited as evenly as poſſible at the bottoms of them; and in the other modes it muſt conſtantly be ſpread out in a regular manner, in order that the crops may be brought forward with as much uniformity as poſſible. In raiſing crops of the early kinds of potatoes, it may be a more advantageous practice to apply the manure for the previous crop; as where the contrary is the caſe, the haulm or ſtems of the plants are apt to become too luxuriant, and thereby prevent the roots from acquiring a proper ſize. Beſides, it is probable that the flavour of the potatoe may be better, and the ſubſtance leſs watery.

Time of planting.—The putting of this ſort of crop into the ground ſhould always be performed in the early ſpring months, as ſoon as poſſible after the danger of froſt is over, which, in the more ſouthern diſtricts, is generally from about the middle of March till the latter end of April; and, in the northern ones, it is moſtly from about the middle of April until towards the cloſe of May, according to the differences in the ſtate of the climate. The earlier the crop can be got into the ground, the better it becomes, as the potatoes are ſaid to turn out more mealy, and of a finer flavour. Beſides, they have a better chance of being taken up and removed from the land, while the ſeaſon is dry; and there is leſs riſk of injury from moiſture and froſts after they are fit for taking up. It may alſo be added, that the land will derive much advantage from being ploughed up while it is in a dry condition, after the potatoes have been removed, as in this way it is preſerved in a leſs moiſt ſtate during the win-

* Engliſh Encyclopædia, art. Huſbandry; and Bath Papers. † Billingſly, in Bath Papers, vol. VI.

ter, and the weeds are more effectually deſtroyed *. But at whatever period the crop may be put into the ground, the buſineſs ſhould be performed as much as poſſible when the weather is dry, and the land not too much ſoaked with moiſture, as under ſuch circumſtances the early vegetation of the crop always proceeds in a more regular and expeditious manner, by which the produce is generally rendered better in quality and more abundant.

Seed.—In the choice of potatoe ſeed for the purpoſe of planting, it is neceſſary to attend to the differences in the varieties, in reſpect to forwardneſs, their qualities as food for man or animals, and the variation in their productiveneſs; as upon the properly adapting theſe to the nature of the ſoil and climate, as well as the views of the cultivator, much advantage may probably be obtained in the culture of the crop. It is generally recommended, that the ſets ſhould be taken from ſuch potatoes as are the fineſt and moſt perfect of their kinds, as by ſuch means better crops may be produced, at the ſame time that there will be leſs riſk of their being attacked by diſeaſe. And it is contended by ſome, that, from the eyes being ſtronger in ſuch large-ſized potatoes, ſtronger and more vigorous plants are produced, and of courſe a larger produce afforded. The difference between the uſe of large and ſmall potatoes, for the purpoſe of ſeed, being in the proportion of thirty ſacks to the acre in favour of the former †. It may alſo be of great advantage in the culture of this root, to take the ſeed or ſets from ſuch varieties as have not been too long cultivated, as it has been found, that the continuing the cultivation of the ſame ſorts for ſome length of time has a tendency not only to injure the quality, but leſſen the quantity of the produce ‡. It has likewiſe been ſuggeſted, that the potatoes intended for ſeed ſhould be raiſed without manure in ſuch ſoils as are of the fertile kind; and on thoſe that are of a poor quality, by a leſs proportion than is uſually the caſe, and without ſo much earthing up in the after-culture of the crop, as, by ſuch means, it is ſuppoſed there may be leſs danger of the crops becoming affected by diſeaſe ‖. In the ſame intention, it has been recommended by different cultivators to change the ſeed every two years, carefully collecting ſuch as is brought from a conſiderable diſtance. It would ſeem probable, however, that, in guarding againſt accidents of this kind, much depends upon the ground being well prepared for the reception of the crop, and on the after-culture being perfectly performed.

* Campbell, in Bath Papers, vol. IX.

† Experienced Farmer, vol. I.

‡ Bath Papers, vol. IX.

‖ Corrected Report of Middleſex, and Tranſactions of the Society of Arts, &c.

In reſpect to the ſeed or ſets, different modes have been adviſed by different cultivators, ſome preferring whole potatoes, or large cuttings, while others think ſmall cuttings, ſprouts, or even the eyes, the moſt beneficial. All theſe different ſorts of ſets are, indeed, found in practice to produce good crops; though it ſeems probable, from the various experiments that have been made upon the ſubject, that the middle-ſized whole potatoes, and the large cuttings of large ones, are in general more productive than either the ſmaller ſort of whole potatoes, ſmall cuttings, or the eyes or ſhoots alone *.

If, indeed, the expence in ſeed, where whole potatoes are made uſe of, be taken into the account, it is probable that the large cuttings of middling-ſized

* The reſults of the experiments made by the Rev. Mr. Campbell, as ſtated in the Bath Papers, in order to aſcertain the ſuperiority of the different kinds of ſets, and the moſt proper diſtance of planting in reſpect to the rows, are theſe:

	Rows.	*Inches diſtant in rows.*	*Value of produce per acre, ſeed deducted.* £. s. d.
Experiments in 1790.	1. Small whole potatoes	6	16 6 7¼
	2. Large pieces	3	15 16 6
	3. Large pieces	6	15 8 6
	4. Large pieces	12	13 4 1¾
Experiments in 1791.	1. Large whole	6	18 18 1½
	2. Small whole	3	18 1 4½
	3. Small whole	6	17 11 9½
	4. Small whole	12	17 3 6
	5. Small pieces	6	16 1 5½
Experiments in 1792.	1. Small whole	6	19 7 1½
	2. Large whole	6	18 18 1½
	3. Large whole	12	18 9 9½
	4. Large pieces	6	18 3 0
	5. Small whole	12	18 1 3¾
	6. Large pieces	12	16 19 6
Experiments in 1794.	1. Middle-ſized whole	12	32 8 0$\frac{3}{12}$
	2. Middle-ſized, confined to one eye and ſtem	12	23 12 1$\frac{11}{12}$
	3. Middle-ſized whole	6	25 7 3$\frac{3}{12}$
	4. Small pieces	12	29 19 2$\frac{3}{12}$
	5. Small pieces	6	28 17 6$\frac{11}{12}$
	6. Small whole	12	29 2 4$\frac{3}{12}$
	7. Small whole	6	26 19 3$\frac{7}{12}$

Experiments

potatoes, where only one or two eyes are preſerved, may be the moſt proper and ſucceſsful in producing crops; as where whole potatoes are employed, from the great number of eyes, and the conſequent production of numerous ſtems, the crops may be liable to be too thick or cloſe on the ground, and in that way be rendered weak, and the produce of courſe ſmall and deficient, the bulbs not being able to ſwell out and diſtend themſelves ſufficiently.

It is remarked by the ingenious experimenter mentioned above, that "the greater the number of ſtrong fibres and roots, the more they ſearch for food, and the more earth they diſplace in the courſe of their growing, which divides the ſoil more minutely and gives it the advantage of better pulveriſation; and the greater abundance there is of leaf, the more nouriſhment is extracted from the air, and which are thus made to co-operate more with the vegetable paſture in the ſoil in bringing the plants to perfection; and the thick foliage of the crop, by its umbrageous ſhade, has the ſame ameliorating qualities with a heavy crop of peas, or beans, in deſtroying weeds, retaining the dews, and preventing the draught from penetrating and exhauſting the ſoil."

He adds, however, that "it is to be obſerved, that too many as well as too few ſtems are unfavourable to the prevalence of fibres, and to the luxuriance of the leaves." It is therefore concluded, that perhaps pieces about two ounces in weight are the moſt proper for being planted, and whole potatoes from that weight to one ounce; theſe, ſays he, may be called large pieces and ſmall potatoes; and from them, it is probable, there will iſſue a ſufficient number of ſtems to produce as many roots as the immediately ſurrounding earth can bring to perfection. To produce more, he thinks, would make the roots ſmall; to produce fewer, would give a leſs quantity of root from the acre.

On theſe accounts, therefore, as well as from large whole potatoes, and large cuttings, conſuming ſo much ſeed, it is evident that they can ſeldom be

EXPERIMENTS IN 1795, without dung, after dunged potatoes.

Rows.	*Inches diſtant in rows.*	*Value of produce per acre, ſeed deducted.* £.	s.	d.
1. Shoots	12	15	11	$9\frac{6}{11}$
2. Large pieces	12	26	1	$10\frac{1}{11}$
3. Large whole	12	23	10	$8\frac{10}{11}$
4. Small whole	12	24	2	$11\frac{1}{11}$
5. Middle-ſized whole	12	24	2	$11\frac{1}{11}$
6. Middle-ſized whole	9	23	19	$5\frac{1}{11}$
7. Middle-ſized whole	6	28	11	$7\frac{7}{11}$

employed with advantage, especially as the result of experiment has shewn that such whole potatoes as are moderate in size, and such cuttings as are not too large, are generally capable of producing the best and most abundant crops *.

It is necessary, however, where cuttings are made use of, to take care that they contain a sufficient proportion of matter about the eyes or *root-buds*, to afford nourishment and support to the plant during the process of germination, and until it be perfectly established in the soil.

On the principle of saving seed in scarce and dear seasons, it has been advised by some to have recourse to the shoots †, and, by others ‡, to the eyes only; but the use of these, except under such circumstances, is liable to many objections. Where the shoots are employed, the crops are found to be considerably more backward in becoming ripe, consequently more exposed to the danger of cold winds and frosts about the period of their being taken up; besides, from their being more tender than sets taken from the cuttings of potatoes, they cannot be put into the ground at so early a period. But the most material objection is, in many of the plants being so weak and imperfect in their growth, as to afford little or no produce. Where the plough is made use of in planting them, there may likewise be danger of their being injured by the trampling of the horses, except great care be taken to prevent it.

Where the eye or *root-bud* of the potatoe is employed as seed, it is usually cut out of it by a scoop or implement contrived for the purpose, to the thickness of about half a crown. But though this mode of sets is said to have been made use of with success by some cultivators, it is probably liable to most of the inconveniences that attend the setting of shoots.

Good crops are, however, asserted to have been obtained in this way by different cultivators, in particular descriptions of soil; but others of equal credit assure us, that it is but in very few instances, as where the soil is peculiarly adapted to potatoe crops, that sets of this kind succeed in any tolerable manner. It was found by an intelligent agricultor, in making an experiment with scooped sets, and such as were prepared by cutting with a knife, in the ordinary way, from potatoes of the same kind, that on nine of the best-looking sets of each kind being planted on the same land, in alternate drills, the cuttings came up and proceeded in their growth without sustaining the least injury; while the scooped sets, though they grew, continued in a perfectly dwarfish state when

* Bath Papers, vol. IX.

† Maunsell, in Transactions of Dublin Society, vol. II. 1799.

‡ Stewart, in Ibid.

compared with them. And on being taken up and preſerved in ſeparate baſkets for about a month, and then weighed, the produce of the former afforded by much the greateſt weight; the cut ſets giving one ſtone and half a tron, while the ſcooped ones yielded only three quarters of a ſtone, the ſmall fractions not being noticed. And in another trial, where one peck was cut with the knife, and the ſame quantity prepared by the ſcoop, and ſet in the ſame field, there was no perceptible difference in the growth of the crops while upon the ground; but, on taking them up, the difference of the produce in meaſure was a peck and a half in favour of the cut ſets *.

It was, however, found on planting cut and differently ſcooped ſets alternately, on a light earthy ſoil, in the drill manner, at the diſtance of twenty-four inches between the rows, the ſcooped ſets being prepared to three-fourths and ſeven-eighths of an inch, and the after-culture performed in the ſame way in each; that on taking up the different drills, and meaſuring them ſeparately, the quantity of produce was nearly equal in every caſe. Hence it is concluded, that "ſcooped ſeed, and even the ſmalleſt of the ſcooped ſeed, produce equal to large ones, or thoſe cut in the ordinary way †." Similar ſucceſs ſeems likewiſe to have attended the planting of ſcooped ſeed under the direction of Mr. Ford, in Suffolk ‡. However, though ſuch ſort of ſets may occaſionally, under favourable circumſtances of ſoil and ſituation, afford full crops, it is probably a method of practice that ſhould ſeldom be had recourſe to but in caſes where there is a difficulty of procuring a proper ſupply of other kinds of ſeed.

On the whole, though there is reaſon to ſuppoſe, from the various experiments that have been made on the nature of the ſeed, or ſets of potatoes, that the quantity of produce is not, as has been ſuppoſed, exactly in proportion to the weight of them, yet that it is in ſome meaſure influenced by that circumſtance, and their having a ſuitable number of *root-buds*, as well as a due proportion of pulpy material ſurrounding them, to enſure the perfect evolution and ſupport of the plants in the early ſtages of their growth, and until they become completely eſtabliſhed in the ground.

Methods of Planting.—In the putting of potatoe crops into the ground, different modes are adopted in different circumſtances of ſoil and ſituation. On all the more dry and ſandy deſcriptions of land, the ſurface of the ground ſhould not be raiſed, but kept as much as poſſible on the flat; but where the climate is

* Farmer's Magazine, vol. III. p. 103. † Ibid.

‡ Commercial and Agricultural Magazine, vol. III.

damp, and there is more moiſture in the ſoils, and leſs danger of their becoming too dry for the perfect growth of the potatoe, and on all the thinner ſorts of ſoils, it may be the moſt adviſable method to raiſe the land into what is termed one-bout ridges; as, in this way, the depth of the ſtaple is conſiderably augmented, the manure is more concentrated for the ſupport of the crop, a better bed is provided for the fibrous roots and wires of the plants to eſtabliſh and extend themſelves in, the danger of ſtagnant moiſture guarded againſt, and the after-culture of the crops rendered more eaſy, beneficial, and convenient, by which they may be kept more clean and free from weeds, and be earthed up at different times, ſo as to inſure the moſt full and perfect extenſion of the roots in the fine mold that is thus conſtantly laid up. And as the whole of the proceſs is capable of being performed by means of the common plough and a horſe or two, it is probably the moſt advantageous where ſuch crops are cultivated on land that has been ſome time in the ſtate of tillage. Where the ridges are only required to be ſmall, the operation is completed in one bout of the plough, or by going up with one furrow and laying another up to it in returning, ſo as to produce a ridge in the middle. This is the method that is the moſt commonly purſued in thoſe diſtricts that are the moſt engaged in the cultivation of this valuable root.

It is the cuſtom in the Lancaſhire practice of planting, after the land has been harrowed fine and level on the ſurface, to make equidiſtant drills the length of the field, in doing which, the plough, after making a furrow up the field, muſt be drawn down again on the contrary ſide cloſe by the ſame, throwing the ſoil equal heights on each ſide. Theſe drills are made as wide and deep as will make them capable of containing the dung, which is to be laid in the bottom of each. The diſtance of the drills is ſuch, that when the horſes ſtand in one, each wheel of the cart or tumbrill may be in the middle of the next drills on each ſide. The next operation is to carry in the manure; and as the horſes ſtand in one drill, and each wheel of the cart in a ſimilar ſituation, the neatneſs and order of the land is very little injured. The dung is then to be thrown out of the cart in ſmall heaps, ſufficient to ſupply the three drills which the horſes and the wheels of the cart occupy, a moderate ſcattering of which is to be put into the bottom of each. This will be completed in a very ſhort time by perſons with forks of two tines.

Where long ſtrawy dung, lately thrown out of the ſtables or cow-houſes, or collected from the farm-yard, can be procured, it is employed. When the drills are thus prepared, the ſets are put into them upon the dung about ſix inches

diſtant from each other. The plough is then to be run on both ſides of each drill, to throw the earth which was raiſed out of it upon the potatoes. This operation will elevate it in the middle, and cauſe it to lie ſloping on each ſide like the roof of a houſe. The buſineſs is thus complete until the ſtems of the potatoes begin to make their appearance above ground.

But in the Weſt Riding of Yorkſhire, where the culture of the potatoe is well performed, according to the Report of that diſtrict, after the land has been properly prepared, the beſt cultivators begin to ridge it up by ploughing a furrow round it down, and then taking a ſuitable diſtance according to the nature and qualities of the ſoils, as from about two feet eight inches to three feet, ſuch as are rich and fertile requiring more ſpace of ridge than ſuch as are poor and exhauſted. The manure, where neceſſary, is diſpoſed with regularity in rows by means of a labourer with a fork, in the ridges, the potatoe ſets being then placed at ſuitable diſtances upon it, and covered by the plough.

The method recommended by other cultivators in the northern parts of the iſland, after much experience, is, after the ground has undergone a thorough preparation, and is made perfectly level by repeated ploughing and harrowing in different directions, to draw ſtraight parallel furrows by means of a double earth-boarded plough, drawn by a ſingle horſe, at the diſtance of two feet and an half from each other. This operation is performed in the moſt correct manner, by paſſing the plough twice in the ſame tract, which, when the land lies ſloping or uneven, ſhould be down hill the firſt time. The manure is then brought on in carts from the upper ſides of the fields where they are hilly, the horſes paſſing in one furrow, and each of the wheels in others on the different ſides; they are then emptied by the drivers, who walk behind them with crooked three-pronged forks conſtructed for the purpoſe, leaving it in ſmall heaps in the furrows in which the horſes go, in ſufficient proportions for the three drills. It is then divided and ſpread out in the different rows in as equal a manner as poſſible by women and children, the ſets being put in upon it at the diſtances of about twelve inches from each other, the whole afterwards covered in by the plough, by ſplitting the ridges betwixt the rows, paſſing twice in the ſame tract as in opening the furrows for the rows.

There is another method of planting this root, that prevails pretty generally in the more dry diſtricts, which is that of ſpreading the manure over the whole ſurface of the land in an equal manner after it has been well prepared by twice ploughing and harrowing; the ſets are then planted in every third furrow, the dung and fine mold being turned upon them by the plough. This mode of ſet-

ting potatoes is probably the moſt adapted to thoſe ſorts of ſoil and ſituation in which the moiſture is apt to be too readily diſſipated, as by preſerving a level ſurface it may be more fully preſerved in the interſtices of ſuch porous ſoils. As the whole of the ſurface is in this way covered with dung, it is obvious, however, that a conſiderably larger proportion of manure will be neceſſary, than where it is depoſited in the drills only; it muſt of courſe be an improper mode in ſituations where that article is not eaſily procured.

And in the county of Cheſter, where this uſeful root is extenſively cultivated, it is moſt frequently the cuſtom to form the land into narrow beds of about five feet in breadth by the plough, the manure, when neceſſary, being previouſly ſpread out evenly upon the ground, and turned down. The ſets are then planted by means of a dibbling-ſtick to the depth of about three inches in rows, ten inches apart, and alternately ten and twelve inches in them, ſo as that the root-ſhoots of the plants may occupy the ground as completely as poſſible without interfering with or injuring each other. When the ſhoots of the plants firſt appear upon the ſurface, each of the furrows or diviſions between the beds is dug out to the depth of about one ſpit; the looſe earth thus raiſed being caſt as evenly as poſſible over the plants in the beds, by which they, as well as any weeds that may have ſprung up, are covered, and the growth of the former greatly promoted, while the latter are in a great meaſure deſtroyed. And in caſes where the ſtaple of the land will admit of it, in about a week or ten days afterwards a ſecond covering is dug out and thrown over the crop in the ſame manner, by which its growth is ſtill farther promoted. In this mode of planting, as much freſh earth is from time to time applied to the plants, their vigorous vegetation is not only ſecured, but the extenſion of the roots rendered more full and complete. As a quantity of freſh earth is thus annually furniſhed for the growth and ſupport of the potatoe, it is aſſerted that repeated crops may be taken from the ſame land, even where manure is not made uſe of, without its being exhauſted in any great degree *. It may therefore be had recourſe to with advantage where manure cannot be eaſily procured. And from its being well ſuited to the keeping of the ſoil dry, it may be well adapted to ſuch lands as are inclined too much to the retention of moiſture for the perfect growth of potatoe crops.

Where this ſort of crop is planted upon ſward-land, it has been recommended by an intelligent cultivator, after the land has been prepared by the uſe of a

* Commercial and Agricultural Magazine, vol. I. p. 76.

plough that juſt pares off the ſurface and depoſits it in the furrow, to place the ſets upon the inverted ſod, and cover them with the looſe mold from below by means of a common plough *. In this caſe the ſets may alſo be put in by a dibble where that method is preferred; but the former is probably the better practice, as the turfy material on which the ſets are put, in this method of planting, ſoon begins to decay, the purpoſe of manure is in ſome meaſure anſwered. It is therefore a plan that may be advantageous where manure is ſcarce, as in bringing waſte and other coarſe graſs lands into the ſtate of tillage.

Theſe are the principal modes of planting that are employed where the plough is had recourſe to; but where labour is cheap, crops of this ſort are frequently ſet by the ſpade.

Where this is the caſe, after the lands have been once well dug over from the ſtate of the ſward, it is frequently a practice to form a trench acroſs the end of the ridge to the width of about three feet, and from ten to fifteen inches in depth, according to the ſtaple of the land. After this another trench of the ſame dimenſions is made on the ſide of the former, the ſurface materials, to the depth of ſix or ſeven inches, being thrown into the bottom of the preceding trench upon which the proper ſupply of manure is laid, and the potatoe ſets put in at the diſtance of eight or ten inches from each other, after which the neceſſary quantity of earth is raiſed from the bottom of this trench to cover the ſets in the firſt, and bring it to its proper level. This, though a laborious method of proceeding, and not by any means calculated for the extenſive cultivator, provides an excellent bed for the reception of the ſeed, and leaves the land in a high ſtate of preparation for ſuch crops as may be afterwards grown. Beſides, as the graſſy material anſwers the purpoſe of manure by its gradual decay, it may probably be had recourſe to where that article cannot be eaſily obtained.

There is ſtill another mode of planting the potatoe by the ſpade; which is that of forming the ground into beds of about ſix or ſeven feet in width, according as the land may abound or be deficient in moiſture, three or four feet on each ſide being left to be dug for trenches. The ſurface of the bed is then to be dug over, and a ſuitable proportion of manure applied equally over it. The ſets are then planted upon it at ſimilar diſtances to theſe juſt mentioned, and covered by means of the mold dug from the ſide trenches, to the depth of three or four inches. In fertile good ſtapled ſoils, from the roots of the plants having plenty of looſe mold to fix and extend themſelves in, in this method of

* Mr. Somerville.

planting good crops are often produced; but on the poor and thin ſorts of ſoil it is a mode that can ſeldom be attempted with ſucceſs. It is perhaps the beſt adapted to ſuch lands as are inclined to the retention of moiſture, as in ſuch the largeneſs of the trenches has the effect of removing the injuries ariſing from the ſtagnation of water about the roots of the plants. This is generally termed the *lazy-bed* method of planting.

Where the ſhoots of the potatoes are made uſe of as ſets, it has been adviſed to place them in half-drills, or ſuch as are made by throwing the earth off on one ſide only, which may be formed by the ſpade, or even by a very ſmall plough contrived for the purpoſe, at the diſtance of eight or ten inches from each other, after being carefully picked from off the potatoes, and ſeven or eight inches apart in the rows, the root of the ſhoot being put downwards. This may be performed by children. A ſmall proportion of dung is then to be laid thinly over them, and the earth from the ſides of the drills lightly drawn over them, ſo as to guard them againſt any froſt that may happen. When they have thrown out leaves, and are about four inches above the ground, another covering is to be given, ſo as to leave about two inches above the ſurface; and as they advance in growth, continue to cover them in this manner, till the earth between the ridges raiſes the drills at leaſt twelve or fourteen inches in height. Shoots that are employed in this way ſhould be ſtrong and vigorous, about ſix inches in length, and planted while freſh and in a ſtate of perfect growth. The ſhoots may be preſerved for planting by taking them off from the potatoes, either all at once or occaſionally as they are uſed, without bruiſing, and laying them croſſways upon each other, a light covering of earth being placed over them. In this way they may be kept a month or ſix weeks till the land is ready for their reception *.

It has likewiſe been ſuggeſted, that crops of this ſort may be raiſed by tranſplanting ſuch young plants as have come up by chance on grounds that have had potatoes, or been prepared for the purpoſe in beds of rich earth and dung.

And it is indeed aſſerted to have been found by experiments attentively made, that planting the ſeed on moderate-ſized dunghills for about three weeks before they are put into the ground, renders them forwarder by five or ſix weeks than in the ordinary manner, and that the heat afforded by the dung ſeems to communicate a healthy vigor to the plants that is maintained during the whole of their after-growth †.

* Commercial and Agricultural Magazine, vol. VI.

† Farmer's Magazine, vol. III. p. 142.

But as much injury muſt conſtantly be done to the ſhoots of the plants in the operation of taking them up, and as roots of the potatoe kind ſeldom grow very well after being removed, it is probable that ſuch a method of planting can ſcarcely ever be adopted with advantage, except in filling up the rows when defective, or in procuring more early crops, whether in the field or garden culture of the root.

In whatever method potatoe crops are put into the earth, experience ſhews that it is neceſſary that care be taken not to plant the ſets to too great a depth, as the potatoe has a conſtant tendency to riſe towards the ſurface; four or five inches is moſtly ſufficient in all the drier ſorts of ſoil, and in thoſe of the more moiſt and heavy nature leſs may be proper.

There is another circumſtance that deſerves great attention in the planting of this moſt uſeful vegetable; which is that of the ſets, of whatever kind they may be, being depoſited in or covered by ſuch mold as is in a fine ſtate of mellowneſs and pulveriſation: as, where the earth by which they are ſurrounded is in a lumpy and unbroken condition, the crops are never ſo fine or productive. In proof of this, a ſtriking fact has been recorded by a correſpondent of the Board of Agriculture, who, on viewing a crop of about three quarters of an acre, planted by a gardener of the name of Watt, near Leiceſter, remarked that an eighth-part of it was at leaſt ſix inches higher than the other part. On enquiry it was found that the land, which was of an equal quality throughout, was all prepared by digging in the ſame manner, had an equal proportion of manure applied to it, the ſets being of the ſame ſort, and moſt of them planted the ſame day; the only difference being, that on the part in which the crop was the moſt full and luxuriant, the planting was performed in drills made by a hand-hoe about a foot aſunder, while the other, by accident, were put in by the dibble at the ſame diſtance. The ſuperiority of the drilled over the dibbled part was eaſily perceptible during the whole of the ſummer, and to the period of taking the crop up, when it was nearly a foot higher in the ſtem, and about a month earlier, ſome of the dibbled being taken up at the ſame time, in order to ſhew the difference. The whole was hoed three times in the ſame manner during the ſummer; and when taken up, on comparing the different crops, the drilled was found to produce a quarter more than the dibbled. Beſides, the potatoes were larger, and nearly a month earlier, both which are advantages of conſiderable importance *.

It has alſo been ſuggeſted as neceſſary, where potatoes are planted in rows on

* Engliſh Encyclopædia, art. Huſbandry.

land without manure, or where the manure has been previouſly incorporated with the ſoil, to draw the furrows or drills much ſhallower than when the manure is to be placed below them, otherwiſe injury may be done by the crop being put in to too great a depth *.

After-culture.—The proper management of the potatoe plant, after it begins to appear above the ground, is a point of great importance in its culture, as it is only by proper attention in this reſpect that full and abundant crops can be produced.

As it has been already ſeen that the roots of this ſort of plant riſe towards the ſurface while they are in a ſtate of growth and forming their knobby bulbs under the ground, it muſt be obviouſly of great advantage to have the mold in a looſe mellow condition frequently applied to them, as by ſuch means the branching out of the ſtringy root-ſhoots or wires is not only greatly promoted, but the diſtenſion of the bulbs more perfectly ſecured, as well as the diligence of the cultivator fully repayed by the increaſe of produce. In order to effect theſe purpoſes, it is the general practice in the beſt-cultivated potatoe diſtricts to have recourſe occaſionally, during almoſt the whole growth of the crop, to ſuch means as pulveriſe, clean, and bring up the fine mold thus provided to the roots of the plants. Theſe are the harrow, the hand and the horſe hoe; by the former, the ſurface mold is rendered fine and powdery, while the latter is beneficial in bringing it up to the rows of the plants. In performing theſe operations, it is the practice of a cultivator who has had much experience in raiſing potatoe crops, to harrow the land over when the growths from the ſets under the ſurface are advanced about an inch; which is only to be aſcertained by inſpection, as the germination of the ſets varies conſiderably according to the circumſtances under which it takes place. The above period is ſuppoſed the moſt proper, from the more advanced growth of the weeds rendering their extirpation more complete, as well as from there being danger of injuring the young ſhoots by breaking them off when delayed much longer. This proceſs is conveniently performed by a ſmall folding-harrow invented by the writer, which is drawn along the intervals by a ſingle horſe, in which operation it applies mold to the oppoſite ſides of two contiguous rows, deſtroys the weeds, and pulveriſes the ſoil, without the inconvenience of levelling the ridges, which would not only eradicate and break off many of the roots and ſhoots, but prevent the advantage of their being kept dry. After this, when the potatoes are wholly up, the earth and weeds are to be removed from them by going as cloſe as poſſible with an ebb furrow, and laid

* Bath Papers.

into the middle of the intervals by a ſmall plough with a very narrow earth-board. This is to be performed exactly under the above circumſtances; as, when done earlier, there may be inconvenience from thoſe plants that are not fully up being deſtroyed, and, when delayed much longer, there will not be an equal degree of benefit derived from the operation. It is likewiſe recommended that, in a few days after the firſt hoeing, the ſame implement be paſſed in the ſame tract to a greater depth. By thus ſtirring the earth in the intervals that had been trampled down by weeders or other means, it is rendered free, and the weeds that had been removed completely covered; and after the weeds, thus covered up in the intervals, are fully decayed and converted into new vegetable food, the earth is returned to the plants with a double-earth-boarded plough, by paſſing twice in the ſame tract, and turning a ſlight furrow to each ſide, the firſt being made down hill where the field is uneven, a perſon following the plough to remove the earth from ſuch plants as may have been covered in the rows by the proceſs, as, when left in that manner, their growth is either wholly prevented or very much reſtricted. And in places where the plants are left without having the mold applied round them, it is to be brought into contact with them by means of the hand-hoe.

After the plants have advanced to the height of about ſix inches, the earth is again laid up to them ſtill higher by means of the double-earth-boarded plough, paſſing twice in the lines of the former earthings, but ſtill conſiderably deeper than before. In this way the hoeing of the crop is completed *.

By this method of conſtantly keeping freſh mold applied to the ſtems of the plants during the period of their growth, the produce has been found to be greatly increaſed, as it affords a facility to the wires for extending themſelves in the looſe earth thus laid up, as well as contributes to the perfect growth of the plants. It has been aſcertained by different trials inſtituted for the purpoſe, that each ſeparate hoeing or earthing up of the plants is uſeful in promoting a freſh ſet of runners, and that the potatoes are produced in tiers, according as the different hoeings have been performed; and it has alſo been found, that where the ſecond and third earthings have not been attended to, the produce has been conſiderably diminiſhed †.

In Lancaſhire the potatoe crops are moſtly kept free from weeds by means of the plough, by turning the earth in the intervals of the rows towards the young plants as ſoon as they preſent themſelves above the ſurface of the

* Campbell in Bath Papers, vol. IX.

† Farmer's Magazine, vol. III. p. 145.

ground, and in a ſhort time afterwards by turning it back again from each ſide of them; and occaſionally, when the land is very foul, by paſſing a ſmall triangular harrow between each of the rows. After the weeds have been removed in this way, the mold is again applied to the plants in the ſame manner as before, or by means of a double-mold-boarded plough. In this way the crop is rendered clean, and the fine reduced mold well laid up to the ſtems of the plants.

It is, however, the cuſtom in ſome diſtricts, where the planting of this uſeful root is performed on the plain ſurface without ridges, to depend upon repeated harrowing during the early growth of the crop, for keeping the lands free from weeds as well as for earthing up the plants; but it is evident, that by this method the ground, eſpecially when inclined to be moiſt, is not only rendered too flat, but little aſſiſtance afforded from the ſmall portion of mold that can be brought to the root ſtems of the plants. Beſides, theſe operations can only be continued for a ſhort time during the early growth of the crop. As it is attended with leſs expence, it may, however, be practiſed where the ſoil is light, thin, and liable to become too dry. But, in general, the more perfect and the longer the ſtirring of the ground between the rows can be continued, provided the implement does not preſs too deep in the latter ones, the more vigorous and abundant the crops will be.

The earthing up of crops of potatoes by means of the plough has been objected to by ſome cultivators, on the principle that it has a tendency to injure or deſtroy the knotty wires of the plants that extend themſelves laterally; but this can ſeldom be the caſe when the plants are put in at proper diſtances, and the operation carefully performed; but, in order to remove any danger in this way, the proceſs may be well executed by means of a ſort of cultivator termed a *brake*, which is much employed by the Kentiſh farmers for this purpoſe, as well as for cleaning and earthing up different ſorts of podded crops.

Mr. Billingſley, however, on the authority of much experience, adviſes that the hoe be never made uſe of after the potatoe plants have begun to throw out their wires or ſtrings, and form their bulbs; as, ſhould weeds afterwards ariſe, they may be removed by means of hand-labour.

The expence of cultivating crops of this root, though it will vary much according to the nature and condition of the ſoil, the method of planting, and various other circumſtances, yet, from the preparation and labour neceſſary in bringing the ground into a ſuitable ſtate for the reception of the ſeed and in putting it in, it muſt conſtantly be high. It may in general be ſtated to

be from about five or six to eight or nine pounds the acre, according to the differences of the land, and the difficulty of obtaining labourers *. Crops of this sort are not, however, to be considered merely in regard to the immediate profit they may afford, but also as the means of preparing and bringing the lands on which they are produced into a suitable condition for the growth of grain. As the cultivation of roots of this nature answers the purpose of an expensive summer fallow, the farmer has an advantage even where they only repay the expences incurred in manure and other articles; but they will mostly, where proper attention is bestowed, do considerably more, notwithstanding the heavy expence of preparing the ground, and planting such crops.

It has been advised by some cultivators to cut away the parts of the potatoe plants which contain the flowers before the blossoms begin to blow, in order to increase the size of the potatoes; but this is a practice that has been shewn to be too tedious to be generally adopted, though it seems probable that the production of the fruit or apple may be detrimental in drawing away the nourishment of the bulbs below the ground at the period when they stand most in need of it. And, in the few trials that have been made in this view, some have supposed an advantage to be derived from it; as after planting different kinds in drills, and picking the flowers carefully from off the plants in some of them as soon as they appeared, in others after they had expanded or even made some progress towards setting the fruit, and in others again after it was formed and half-grown, while other drills between them were left untouched, it was found

* In the West Riding of Yorkshire, according to the Agricultural Report of that district, the expence and profit on an acre of potatoes are thus stated:

	DR.					CR.		
Expences.	£.	s.	d.	*Produce.*		£.	s.	d.
Land rent	1	5	0					
Working and ridging	1	5	0					
Seed potatoes, six sacks, at 7s.	2	2	0	By 60 sacks, at 5s. 6d. per sack		16	10	0
Cutting ditto, and setting	0	2	0			8	1	0
Manure and leading	2	2	0					
Hoeing, weeding, and taking up	1	5	0	Profit		£. 8	9	0
	8	1	0					

Various estimates of expence and produce on a large scale, under different modes of preparation and planting, may be seen in an ingenious paper by Mr. Billingsley, in the sixth volume of the Letters and Papers of the Bath Agricultural Society.

that the crop, in the firſt method of plucking the bloſſoms, was in moſt caſes nearly double to that in which the apples were permitted to become ripe. Where the flowers were ſuffered to waſte themſelves only, the crops were leſs productive; and where the apples had made ſome progreſs, it was ſtill ſmaller; but in both conſiderably greater than in the untouched rows. It was likewiſe remarked, that the ſtems of the plants, in the caſes where the bloſſoms had been picked off, continued in a more full and vigorous ſtate of growth much longer than where they were permitted to remain. And the ſame circumſtances took place where the apples were gathered early *.

The trials of other experimenters ſeem, however, to contradict theſe ſtatements; as in plucking the bloſſoms from ſome drills, and leaving others in their natural ſtate, on taking up the crops not the leaſt perceptible difference could be perceived in the produce †. But though beneficial conſequences may perhaps in ſome inſtances be produced by the pulling off the bloſſoms of potatoe plants, in order to prevent the ſeed from being formed, as is the practice in particular caſes in gardening, the experiments of different writers have clearly ſhown that the cutting over the haulm or ſtraw is invariably injurious to the ſucceſs of the crops, the large produce and great luxuriance of the plants probably requiring the aſſiſtance of the leaves and ſtems to perfect their growth. When cut at different ſtages, in ſome trials the deficiency of the produce was found to be exactly in proportion to the earlineſs of the operations being performed; and that the potatoes were badly ripened, as well as of a bad quality, while thoſe growing on the ſame land cloſe to them, but in which the haulm had been left uncut, were extremely good ‡. It has indeed been recommended by an experienced cultivator of this root, never to cut the ſtems of potatoes at any period of their growth; as the roots not only continue to improve till the ſtems have decayed ſo as to be of no utility, but ceaſe the inſtant they are deprived of them ‖.

Curl.—Beſides the injury that may ariſe to crops of this ſort from the above practice, they are frequently liable to be much hurt by the *curl*; a diſeaſe in which the leaves of the plants are, as it were, ſhrivelled or curled up, and the healthy appearance and vigor of the crop greatly impaired. The reaſon of this pernicious vegetable affection appears not yet fully inveſtigated, as it has been aſcribed to many different cauſes by writers on huſbandry. Moſt of early au-

* Farmer's Magazine, vol. II. p. 412.
† Ibid. vol. II. p. 412.
‡ Ibid. vol. III. p. 103.
‖ Campbell, in Bath Papers, vol. IX.

thors conſidered it in general as originating from diſtempered ſeed, which cauſed it to appear in the crops wherever it was made uſe of. But in an intereſting paper in the ſecond volume of Communications to the Board of Agriculture, it is ſuggeſted as proceeding from imperfect culture, or ſuch circumſtances as have a tendency to leſſen and impair the vigor of the growth of the plants; as the improper nature of the ſoil, or the want of ſufficient preparation of the land on which the crops are grown. It has likewiſe been ſuppoſed to owe its origin to the continued propagation of potatoes by ſubterraneous buds, or root-wires, inſtead of ſeed, as by ſuch means they acquire hereditary diſeaſe; as happens in gardening, in the caſe of canker, to ſuch apple-trees as have been a great length of time propagated by grafting the ſcions. In oppoſition to this, it has, however, been maintained by ſome cultivators, that they have found the curl to prevail in the potatoe plants in ſuch crops as had been raiſed from ſeed of the ſecond year. By others it has alſo been aſſerted, that inſects attacking the leaves may be the cauſe of the curl; and ſtill others, that the potatoe roots, the leaves of which are attacked with the curl, remain hard and leſs diſſoluble in the ſoil *.

And it has lately been contended, that this diſeaſe in potatoe crops proceeds from inſects beneath the ground deſtroying the nutritive part of the ſets after they are depoſited in the ſoil; as it was found that, from a potatoe planted in a field as ſeed, there proceeded four ſtems, two of which were weak and delicate, having their leaves attacked with this diſeaſe, while the other two were in a highly vigorous ſtate, and their leaves freſh and free from the curl. On the root being taken up, it was diſcovered, that all the part from which the curl-leaved ſtems proceeded was excavated, the ſubſtance being wholly conſumed by inſects. And on more frequently examining ſuch roots as had their leaves affected, it has conſtantly been found that they have been deſtroyed by inſects, either of the ſnail, centipede, or beetle kind. Sometimes it is, indeed, ſuppoſed, that the diſeaſe may be cauſed by the leaves only becoming the prey of numerous minute animalculæ, but that the general cauſe is in the ſeed itſelf being conſumed.

On this account it is, therefore, that the diſeaſe abounds more in potatoe crops in the rich ſoils in the vicinity of cities, and in that of well-manured gardens; as in ſuch, inſects are the moſt predominant.

It is alſo ſuſpected that ſome ſorts of potatoes are more liable to be attacked

* Phytologia, p. 475.

by animals of the above kinds than others, as they have ſcarcely ever been obſerved to meddle with the yam. Such varieties of the potatoe as have been brought from backward diſtricts, and which have not been perfectly ripened, are likewiſe, it is thought, ſeldom reliſhed by theſe inſects. But ſuch as have been made in any degree ſweet and mellow by the action of froſt, are ſure to be attacked by them *.

As the general experience of cultivators has fully ſhewn that the crops of ſuch potatoe ſets as have been brought from high cold climates, where the potatoe ſcarcely ever arrives at that ſtate of perfect maturity in which ſeed is produced, is rarely if ever affected with the curl for the firſt year, this opinion is rendered extremely probable †.

And the trials of a very extenſive cultivator not only clearly demonſtrated that there was not the leaſt difference in reſpect to the production of this diſeaſe, whether whole potatoes, large cuttings, ſmall cuttings, or the eyes merely, were employed; but that ſuch potatoes as were brought from the late diſtricts about Dumfries in Scotland, were never known to afford curled crops the *firſt* year. The cultivator is, however, cautioned againſt uſing them in the third year, as, however rich the land or good the manure may be, they will almoſt all be affected with the curl if ſet in the ſame ſoil ‡.

It is added by the former of theſe experimenters, that the produce of ſuch potatoe plants as have once been under the influence of this diſeaſe will conſtantly, if planted in the ſame ground, continue to produce diſeaſed crops §.

There is ſtill another cauſe to which this baneful diſeaſe in the leaf of the potatoe plant has been aſcribed; which is, that of the ſeaſon. It is remarked, that where the early part of the ſeaſon is mild and warm, in ſuch a degree as to permit the plants to vegetate and ſpring up in a perfect manner and to eſtabliſh themſelves well in the ground, there will be little or none of the diſeaſe; but that where the crop has been planted at too early a period, or where the advance of warm weather is ſlow and late, the diſeaſe will ſhew itſelf in a high degree. Thus, where the ſpring is late, cold, and froſty, and the potatoes ſet at an early period, the crop is moſtly injured by the curl; while thoſe that are planted at a later period, and which are not ſo much expoſed to the effects of cold and froſt in their early growth, are more free from the diſeaſe. In proof of this, it is obſerved, that potatoes planted on elevated, hilly, and moiſt ſituations,

* Farmer's Magazine, vol. III. p. 217. † Ibid. ‡ Billingſley, in Bath Papers, vol. VI.
§ Ibid. p. 218.

which cannot be ſet ſo early as in lower and more warm diſtricts, and which ſeldom appear perfectly above the ground before the latter end of May, are almoſt wholly free from the curl, on which account they are generally had recourſe to as ſeed.

But though many of theſe different cauſes may operate in producing a tendency to the production of the curl in potatoe crops, they do not any of them ſeem fully ſufficient to account for the diſeaſe in a perfectly ſatisfactory manner. Further inveſtigation into the nature of the diſeaſe is ſtill wanting, in order fully to elucidate its cauſe. It appears probable, however, that imperfect culture, too early planting, cold, froſt, and backward ſeaſons, or other cauſes that have a tendency to diminiſh the vigor of the plants in the early ſtages of their growth and bring on a ſtate of debility, may render the ſtems as well as leaves more ſweet, and conſequently more liable to be devoured by the attacks of animalculæ, at the ſame time that, from the imperfect conſumption of the ſweet nutritious material elaborated in the ſet for the ſupport of the young plant, in ſuch caſes, the roots may be more expoſed to become the prey of inſects, and in this way the diſeaſe be produced. That ſomething of this nature takes place ſeems evident, from the circumſtance of only ſome of the plants being diſeaſed, while others nearly adjoining them are in a healthy and luxuriant condition.

But from whatever cauſe this vegetable malady may take its origin, no effectual remedy ſeems yet to have been diſcovered, but that of a frequent change of ſeed, and having recourſe to ſuch as is brought from a diſtance, and from ſuch diſtricts as are later, and have ſoils different from that in which they are to be planted. Where the convenience of ſhipping admits of it, the beſt method is probably to have the ſeed potatoes from Scotland, or ſome of the northern counties of England; as experience has ſhewn, that ſeed potatoes from theſe parts of the iſland ſeldom produce many diſeaſed plants for the firſt or ſecond year *. Where inſects or animalculæ are conſidered as the cauſe of curl, the changing of the ſeed muſt alſo be a principal mean of preventing the diſeaſe, as in this way we have juſt ſeen that ſuch kinds of potatoes may be employed as they are not diſpoſed to attack. But, beſides this, it may be adviſable to have this ſort of crop planted as little as poſſible on the rich field or garden ſoils that have been long in a ſtate of tillage, and which of courſe abound moſt with inſects.

* Billingſley, in Bath Papers, vol. VI.

And as it has been found that the produce of ſuch potatoes as have been once affected with the curl will, when planted on the ſame land, uniformly continue to afford curled plants, a change of the ſeed of the potatoe may in all ſituations be more eſſentially requiſite than that of moſt other ſorts of crops.

It has likewiſe been remarked, that on taking up the potatoes in a field that had been partly planted with ſuch ſeed as had been produced on the land, and partly by that from a colder climate, and conſequently a later, that the produce in the former caſe was at leaſt in the proportion of three to one leſs than in the latter *.

In the idea that the diſeaſe is produced by the devouring attacks of inſects on the ſets, it ſeems not improbable but that advantage might alſo be derived from the impregnation of them with ſuch liquid ſubſtances as they are found to avoid, or which are noxious to them, in the way of ſteeps. In performing this, great care ſhould, however, be taken that ſuch materials be not employed as have a tendency to injure their vegetative quality.

Beſides theſe, it may be of great utility in guarding againſt the diſeaſe to be particularly attentive to the preparation of the ground, the proper ſeaſon of planting according to the nature and ſituation of the land, and to the accurate after-culture of the crop; as there is reaſon to ſuppoſe, that where theſe points are either wholly neglected, or performed in an incomplete manner, the crops are more liable to be injured by the curl †.

In Mr. Chapple's experiments, conſiderable advantage ſeemed likewiſe to be derived from ſelecting the beſt and moſt perfect potatoes for ſeed, from ſuch as had been grown upon a piece of ground ſet apart for the purpoſe at a diſtance from the others, and during the after-culture of the crop picking out the diſeaſed plants ‡.

It has alſo been lately ſuggeſted, that by uſing the dark brown-coloured excreſcence that grows to the ſize of a large horſe-bean on the haulm or *ſtraw* of the potatoe near to the ground, or what is termed in ſome places the *potatoe bean*, for ſeed, the curl may be prevented. Theſe beans have the form of the potatoe, and preſent a number of eyes, from one of which two ſmall leaves generally iſſue.

In an experiment made with theſe, in order to aſcertain their vegetative property, it was found that they produced a large number of potatoes of the ordinary ſize, but of inferior quality. Theſe, however, on being cut and planted

* Farmer's Magazine, vol. III.; and Bath Papers.

† Communications to the Board of Agriculture, vol. II. ‡ Bath Papers.

the following year, afforded potatoes of an excellent quality, and in great abundance. Encouraged by theſe trials, a ſufficient proportion of this ſort of ſets has been annually collected and planted for the purpoſe of ſupplying ſeed for the enſuing year's crop. It has been the invariable practice of the cultivator to plant them at the ſame diſtance as in the ordinary method for thoſe of common ſets, and to manage the crops every way in a ſimilar manner. The quantity of produce has moſtly been equal to that with the common ſeed: and under this plan, it is aſſerted no other change in the ſeed has ever been found neceſſary *. But however effectual ſuch a method may be in preventing the curl in potatoe crops, it is obviouſly too tedious and expenſive to be introduced into the field culture of the root with advantage. Yet, if further experience ſhould confirm the above, it ſeems not improbable but that it might be an uſeful practice in the more limited ſcale of garden culture.

The produce of this ſort of crop is ſhewn to have attained the full ſize, and to be in a proper ſtate for being taken up, by the leaves beginning to wither and fall off, and the ſtems to decay; after ſuch appearances, they ſhould, therefore, as ſoon as poſſible, be removed from the ground, in order that they may be ſecure from the danger of froſt, which is ſometimes apt to take place about the period when the late-planted crops become ripe. About the latter end of September, or beginning of October, is the ſeaſon in which the general crop is moſtly taken up; but the garden and other early crops may be taken up at any time, ſo as to ſuit the particular views and convenience of the cultivator, after the ſtems have attained their complete growth, which is known in moſt caſes by the production of bloſſom.

The manner of performing this buſineſs is different, according to the extent of the crop, and the mode in which it has been planted. In the garden, and where the ſpace of ground occupied by it is but ſmall, digging the potatoes out by means of a broad three-pronged fork is probably the beſt practice; as in this way the ground may, at the time the potatoes are taken up, be dug over, and left in an even and regular ſtate: but where the crop is of conſiderable extent, and the land not of ſo light and mellow a nature, but planted in drills for the uſe of the horſe-hoe, the plough may be the moſt economical, as the earth ſeldom digs well.

For this purpoſe, it will only, however, be neceſſary to make uſe of a light plough without any coulter, turning up the earth of the rows by the ſhare; as by

* Farmer's Magazine, vol. III. p. 13.

that means the potatoes are leſs in danger of being injured. In this method, in ſome caſes, it is the cuſtom to ſet the ſhare againſt the rows to a good depth, and at once turn them up; while in others it is the ordinary practice firſt to turn a furrow from each ſide of the drills, and afterwards to plough up the middle part, in which moſt of the potatoes are lodged. And in ſome other caſes, after the ſide furrows have been removed, it is uſual to turn over the part that principally contains the potatoes by hand labour with a three-pronged fork *.

In whichever way the crop is taken up, the haulm or ſtems ſhould firſt be cut off cloſe by the ſurface of the ground, or pulled up and removed from the land. Where the crop is taken up by hand-labour, one perſon will generally be ſufficient for picking up the potatoes; but in taking them up by means of the plough, the number muſt be increaſed according to the circumſtances of the crop, always being ſufficient to keep up with the plough, otherwiſe there will be great loſs in the economy of time from the team occaſionally remaining unemployed.

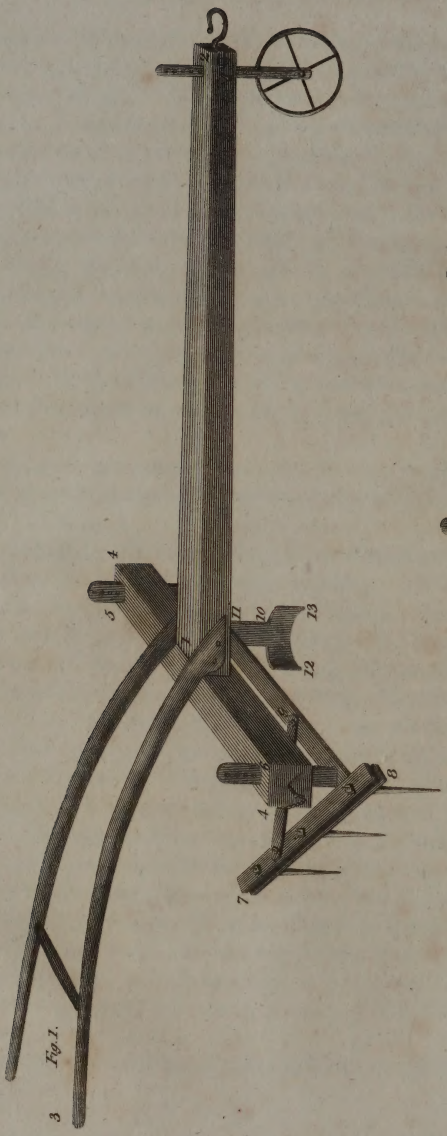
Some likewiſe recommend the land to be once or twice harrowed over afterwards, in order to bring ſuch potatoes as may have eſcaped the pickers to the ſurface †.

In accompliſhing this work, it is of much advantage to ſeparate the ſmall and bruiſed from the middling and large potatoes. It is likewiſe of conſequence to chooſe as dry a time as poſſible for the buſineſs; as when this ſort of crop is taken up wet, it is never found to keep well. After the whole of the crop has been raiſed from the ground, it ſhould be ſpread thinly upon a dry floor, and be allowed ſome days in order that it may become perfectly dry before it is depoſited in the ſituation in which it is to remain during the winter.

The produce in crops of this as well as other kinds muſt vary much, according to the circumſtances of ſoil, cultivation, and ſeaſon. It has been ſtated by Mr. Donaldſon to be from five to eight or ten tons, and on the average over the whole kingdom about ſix tons, to the Engliſh ſtatute acre. In Mr. Billingſley's extenſive experience in the growing of this vegetable, he appears never to have had a greater produce than about a ſack in a perch of ground, or one hundred and ſixty ſacks on the acre, of the eating kinds of potatoes; but he is aware that a much larger produce may be obtained of thoſe ſorts employed in the feeding of cattle, though he ſeems to think them leſs nutritious. In Yorkſhire, according to the Agricultural Report of that diſtrict, from three to four

* Modern Agriculture, vol. II.; and Lancaſhire Report. † Experienced Farmer, vol. I.

POTATOE HARROW.



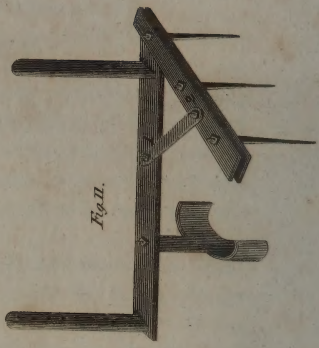


PLATE III.

Potatoe Harrow.

[*To face Page 630, Vol. II.*]

CONTAINS the repreſentation of a Harrow contrived by Mr. Young, for the purpoſe of preventing the great labour and expenſe of breaking the furrow ſlices in taking up potatoe crops by the plough: it is worked by a man and horſe. The curved iron ſlides againſt the unploughed land, at the bottom of the open furrow, and thereby keeps the teeth diagonally placed, to avoid driving the earth in heaps in their work. In friable ſoils three teeth may be employed, but in ſtiffer ones only two. It is a tool that performs its work well, and which has ſaved in his practice from 17s. to 20s. an acre.

		Ft.	*In.*	
The dimenſions in *Fig.* 1. are from	1 to 2 —	5	8	
	1 to 3 —	4	6	
	4 to 5 —	2	6	
	4 to 5 —	0	5	
	4 to 6 —	0	5	
	7 to 8 —	1	9	
	Plate 9 —	0	3	broad.
	Do. —	0	0½	thick.
	10 to 11 —	0	5½	
	Do. breadth of the iron	0	3	
	In the curve —	0	7	
	Breadth of curved iron —	0	3	
	12 to 13 ſtraight line acroſs.			

hundred buſhels of theſe ſorts that are commonly made uſe of at the table, are conſidered as a good produce; but thoſe cultivated for cattle purpoſes moſtly yield from fifty to one hundred buſhels in addition *.

In ſome caſes, in the county of Kent, four buſhels are ſaid to have been dug up from a ſingle ſquare rod of ground, which is at the rate of ſix hundred and forty buſhels to the acre; which, at the price of only one ſhilling the buſhel, would afford thirty-two pounds as the value of the produce †. Crops do not in general, however, afford by any means ſo large a profit.

Still larger quantities have, indeed, been aſſerted to have been produced in particular caſes in the trials of different cultivators, as from ſeven hundred to a thouſand buſhels; but in ſuch inſtances the land muſt have been very rich, and peculiarly ſuitable for the purpoſe, and the ſeaſon unuſually favourable to the crops.

Many different methods of preſervation have been attempted in order to prevent the injurious effects of froſt, moiſture, and germination, on the potatoe, during the winter and early ſpring ſeaſons: as by the firſt it is rendered wholly uſeleſs as an article of food; dampneſs makes it quickly liable to become rotten; and by ſprouting its flavour is conſiderably impaired, conſequently it is leſs proper for the purpoſe of eating: but no perfectly effectual and at the ſame time convenient mode ſeems yet to have been diſcovered. As by too much humidity and heat the vegetative proceſs may be excited too expeditiouſly, while on the contrary the deſtruction of the vital principle may have a tendency to haſten the putrefactive fermentation, the great art of obviating ſuch effects in this as well as other roots, when removed from the earth, would ſeem to conſiſt in preſerving

* The value of the groſs produce of potatoe crops under different methods of cultivation is thus ſtated by Mr. Campbell, in the ninth volume of the Bath Papers:

EXPERIMENTS IN 1794.

Rows.	*Value of groſs produce per acre.* £.	s.	d.
1. Undunged potatoes after dunged turnips . . .	25	19	$8\frac{3}{12}$
2. Undunged after dunged fallow	27	10	$2\frac{6}{12}$
3. Undunged ſubſtituted for a ſummer fallow . .	14	10	$4\frac{1}{12}$
4. Purple-hearted dibbled in the top of a well-dunged row	48	10	$6\frac{4}{12}$
5. White kidney planted in ſame manner . . .	27	2	$5\frac{4}{12}$
6. Ditto, ditto on much dung in row	29	0	$9\frac{6}{12}$
7. Ditto, ditto on little dung in row	24	16	$8\frac{10}{12}$
8. White flat potatoe on ditto, ditto	30	19	0

† Baniſter's Synopſis of Huſbandry.

them in ſuch a ſtate of life, and in ſuch ſituations, as that they may not be liable to receive injury by too high degrees of either heat or cold, or by exceſſes of moiſture. This may be accompliſhed by keeping them perfectly dry, and as much as poſſible in a medium degree of temperature, between the extremes of about forty-eight and thirty-two of Fahrenheit's thermometer; in the former of which the proceſs of germination for the moſt part takes place, and in the latter the deſtruction of the vitality of the roots by the occurrence of froſt *. Such a ſteady temperature, under the conſtantly varying circumſtances of this climate, is not however eaſily attained, and the roots at the ſame time preſerved in a ſtate of ſufficient dryneſs. It has, notwithſtanding, been attempted by burying them in pits below the ſurface of the ground, by depoſiting them in vaults and cellars or other ſimilar ſituations, and by placing them in houſes conſtructed for the purpoſe.

The firſt method, though practiſed in many diſtricts, is ſeldom completely ſucceſsful, except where the ſoil is of a very dry and porous quality, and the incloſing of the potatoes conducted with great care and attention. And, indeed, whatever care may have been beſtowed in the ſtoring of them in this manner, there is moſtly danger from their becoming too much impregnated with moiſture from the ſurrounding earth, and from the cloſeneſs and warmth of ſuch ſituations diſpoſing them to vegetate too quickly in the early ſpring months. Where it is employed, the beſt means of guarding againſt theſe effects is, however, to have recourſe to pretty thick linings, of ſuch ſubſtances as, while they reſiſt the effects of cold, have but little capacity for tranſmitting heat or abſorbing moiſture. In this view, all ſorts of coarſe, woolly, or hairy materials, ſtraw, fine ſhavings, ſaw-duſt, and many other ſimilar matters, may probably be made uſe of with advantage. And on the principle of abſorbing or taking away ſuch putrid exhalations as may be generated among bodies thus cloſely packed together, as well as from its indeſtructible nature, the coarſe powder of charcoal has been adviſed. This is firſt to be applied over the roots to an inch or two in thickneſs, and afterwards layers of one or more of the other materials to ſuch depths as may be ſufficient to preſerve them in the proper ſtate of temperature, and protect them from froſt †. The buſineſs of *pieing* potatoes is managed in ſomewhat a different manner in different diſtricts: in ſome the ground is excavated or hollowed out to the depth of two, three, or more feet, and the potatoes depoſited in the pit, as well as piled up conſiderably above it, ſo as to terminate in a ſort of point or

* Darwin's Phytologia, p. 483. † Ibid.

ridge; in others they are only, however, piled up on the level ſurface in the ſame forms; but whichever method is adopted, the cuſtom is moſtly to cover them with dry ſtraw, about five or ſix inches in thickneſs, and afterwards apply over it a good thick covering of earth, raiſed from a trench dug out all round the heap, and well beaten together by the back of the ſpades over the whole. It is likewiſe the practice in ſome inſtances to perforate the cruſts or coverings of theſe repoſitories, both on the ſides and about the tops, with ſmall holes to the depth of the ſtraw, and at the diſtances of about two or three yards from each other, in order to let any noxious effluvia, that may have been extricated, eſcape, but which are to be well cloſed as ſoon as this purpoſe has been fully accompliſhed *. This would, however, appear to be quite unneceſſary where the potatoes have been put together in a perfectly dry ſtate, and the bruiſed or wounded ones have been carefully ſeparated from the reſt; but when the contrary is the caſe, the fluid diſcharged from them may have a tendency to bring on or run into fermentation, and thus injure ſuch as come near or in contact with them.

This mode of preſervation is, however, only adapted to ſituations where the ſoils are of a dry, gravelly, or ſandy nature; as the retention of moiſture in thoſe that are of the more heavy kind muſt conſtantly endanger the ſafety of the root. And as even the drieſt deſcriptions of ſoils are apt, in particular inſtances and ſeaſons, to become loaded with much humidity, it is probably the beſt mode to ſink the pits as little as poſſible in all caſes, as in this way the riſk of injury may be leſs.

It has been recommended, that the ſituation of theſe repoſitories ſhould be ſuch, as that one of the ends may conſtantly face the north, and that they be always thatched over upon the earthy coat with ſtraw in the manner of corn ſtacks, as by ſuch means the danger of froſt and moiſture is more effectually guarded againſt †. In addition to theſe, where this method is followed, it is alſo probably uſeful to have recourſe to ſome of the other materials beſides ſtraw for forming the internal coats or coverings to the potatoes. And as much inconvenience as well as riſk attends the opening the heaps, it may be adviſable not to have them too large, as by attention in this reſpect the whole may be removed at once, and almoſt immediately converted to uſe.

But in whatever manner this method may be performed, it ſeems to be leſs convenient as well as leſs ſecure than that of ſtoring them in deep dry cellars or vaults of other kinds, where they can not only be eaſily removed as occaſion may

* Corrected Report of Lancaſhire. † Experienced Farmer, vol. I.

require, but be more perfectly safe against moisture. In this mode, the same attention will, however, be requisite in the covering of them up in the winter months as in the others.

The most perfect practice is perhaps that of having houses constructed of suitable materials expressly for the purpose, as in this way the constant trouble and expence of covering and uncovering may be avoided.

Where the cultivation of this root is carried on to a considerable extent, and the produce kept during the winter and early spring months, it may, therefore, be advisable to have a house constructed for the purpose, somewhat on the principle of the dairy-house, or so as constantly to preserve as much as possible an uniform state of temperature between the extremes that have been mentioned, in which the potatoe is found to remain in a perfectly sound and uninjured condition. For such a building a perfectly dry situation, and which is as little exposed to the sun as possible, should always be chosen. In very dry soils it may be the best method to have it sunk something below the surface of the ground, both for the convenience of preserving and storing the crops; but in such as are more retentive of moisture, it will be better to have it wholly above the level of the surface, in order more fully to guard against the effects of dampness. The outside walls may be of earth, well-wrought clay, or any other dense material; but of whatever substances they may be formed, they should be constructed double, or in such a manner as that some kind of light material, such as saw-dust, coarse hair, fern, straw, &c., which has a tendency to resist the action of severe frost, may be lightly stuffed in betwixt them: and the roof, after being well boarded over, should be covered with an extremely thick coat of good wheat or rye straw. The door may also be formed double in the same way as the side walls, and be so contrived as, on being opened, to prevent the entrance of the air as much as possible, being always placed in that part of the building that has a southern aspect. By this sort of house, and proper attention to the nature of the materials of which it is formed, it seems not improbable that potatoes may be equally guarded from the danger of intense frost and that degree of heat which is necessary to their germination in the early spring season. It has, indeed, been suggested, on the principle that clay or earth constitutes the warmest building for the winter season, and the coolest for that of the summer, that houses made wholly of such materials might answer well for the preservation of potatoes *. It is obvious, however, that where such substances are employed alone, they must be less proper, on account of their disposition to

* Farmer's Magazine, vol. III. p. 318.

abſorb and retain moiſture, and the neceſſity of their being made uſe of to a very great thickneſs, as well as from their being extremely liable to crack and form openings; inconveniences that are in a great meaſure avoided in the method juſt deſcribed, and at the ſame time the potatoes more perfectly ſecured.

Beſides theſe means of preſerving potatoes from injury while in their perfect ſtate, others have been ſuggeſted as capable of being employed with ſucceſs without the great expence of fire, where they are reduced into leſs bulky forms. Theſe are chiefly by bringing the ſubſtance of the potatoes into a pulpy ſtate, either by raſping, pounding, or grinding, by machines or mills conſtructed for the purpoſe, and afterwards confining the pulp in a cloth, and reducing it into the form of a thin cake by means of preſſure. The cakes, after this, are to be well dried, by placing them upon ſhelves, and turning them frequently. In preparing potatoes in this manner, it was found, that ſuch potatoes as were peeled thinly before they were reduced into pulp afforded more clean white cakes, and ſuch as appeared to keep better, than where they were merely cleaned and formed into cakes without peeling. And that, though the ſubſtance of the root is compreſſed into a ſixth of its ordinary bulk, and loſes nearly two-thirds of its weight in the proceſs, yet on being dreſſed, either by ſteam or in any other manner, it affords almoſt the ſame proportion of food. Beſides, by the addition of water in an equal quantity to that of the juice, which is forced from the pulp during the time of its compreſſion, a portion of fine white flour or ſtarch proper for the better ſorts of paſtry is depoſited.

It is conceived that, by a machine of conſiderable power, the cakes might even be formed at once, by merely preſſing the potatoes, without their having undergone the preparation mentioned above, the black ſpecks and other impurities only being firſt removed; and that a common cyder or cheeſe preſs, with the aſſiſtance of a lever to increaſe the power, might be employed for the purpoſe *.

This mode of preſerving the ſubſtance of the potatoe may be highly beneficial in many inſtances, but particularly where it is neceſſary to be kept a long time, and uſed in large quantities, as it is ſaid to be capable of being packed in one-ſixth the ſpace that would be requiſite under other circumſtances, and to remain perfectly good many years †.

It ſeems probable likewiſe that potatoes might be rendered capable of keep-

* Commercial and Agricultural Magazine, vol. II. p. 256. † Ibid.

ing ſweet and good for a conſiderable length of time without undergoing the above proceſs, by being cut in thin ſlices, and expoſed to heat in a gradual manner in an oven or upon a ſtove or kiln until the whole of their moiſture is expelled and they become perfectly dry, when they ſhould be incloſed in caſks or other veſſels, and placed in dry ſituations.

And it is ſtated by a late practical writer, that this root may be kept perfectly ſound for a long time, merely by ſpreading them thinly on a dry floor early in the ſpring, and carefully rubbing off the eyes or ſprouts as they appear*; but the flavour of the potatoe appears to be conſiderably altered as ſoon as the proceſs of germination takes place, the whole ſubſtance being rendered more ſoft and ſweet, conſequently leſs palatable.

This root, joined with hay, ſtraw, chaff, and other ſimilar matters, has been found uſeful in many caſes, eſpecially in the later winter months, as a food for horſes and other ſorts of live ſtock; and with theſe ſubſtances, as well as in combination with other materials, as bean or barley meal and pollard, in the fattening of neat cattle, ſheep, and hogs: but as there is conſiderable trouble and expence in preparing them, it being found that they are much more ſafe and nutritious for ſuch animals when boiled, they do not appear to have paid greatly when employed in this way. The reſults of numerous trials detailed by different writers in the Annals of Agriculture do not ſhew them to have been in this mode of application worth more in general than from four pence to five pence the buſhel. When given to horſes, it may be ſomething more, as there is more difficulty in aſcertaining the ſavings in other articles of fodder that are thereby made, and the advantages that are gained by the animals. It has been ſtated to be about ten pence the buſhel†.

The moſt general as well as the moſt uſeful application of this ſort of crop is in that of human food, for which purpoſe the roots are rendered mealy, nutritious, and fit for undergoing the different proceſſes of digeſtion, by means of heat, either in water or ſteam, their acrid juices being in this way converted into mucilage, and probably ſome portion of that into a fine farinaceous or ſtarchy ſubſtance. Experience ſeems to prove, that where the heat is properly applied through the medium of ſteam, the potatoes become more mealy and nouriſhing than where water is made uſe of for the ſame purpoſe. But the differences in the mealineſs produced by the boiling of this root is ſuppoſed by

* Donaldſon's Modern Agriculture, vol. II.

† Annals of Agriculture, vol. XXIX, p. 62.

ſome to depend more upon the nature of the ſoil on which it is grown than on any other circumſtance. And it has been ſuggeſted, that the mealineſs of ſome potatoes that have undergone the operation of boiling, may be ſometimes affected by the acidity of the water in which they have been boiled: but it is believed to depend more generally upon the mucilage in ſome of them being more coagulable than in others, a circumſtance the cauſe of which has not yet been fully inveſtigated *.

The waſhing of this root, where it is employed upon an extenſive ſcale, is frequently a troubleſome operation; it may, however, be performed with great eaſe and convenience, by having a veſſel conſtructed ſomewhat in the form of a barrel, with ſmall ſtrong narrow laths on the ſides, nailed to the ſolid boards, forming the ends at ſuch diſtances as may be ſufficient for preventing the potatoes or other roots from falling through, and at the ſame time for admitting the water to paſs freely. The potatoes are to be introduced and evacuated by means of a door fixed in one of the ſides. The veſſel being thus prepared, is to be hung upon a frame of wood over a large ſquare tub containing water, in ſuch a manner as that about one half of it may be immerſed; a crooked handle projecting at one of the ends, by quickly turning which, when the potatoes are put in, a large quantity may be expeditiouſly waſhed. There ſhould likewiſe be a contrivance in the frame higher up and nearer the ſide of the ciſtern for lifting the barrel, from the place in which it turns, into, in order that, by opening the door and turning it round, the waſhed roots may be eaſily delivered into a barrow or other veſſel placed below and appropriated to their reception.

There is ſtill another circumſtance in regard to potatoe crops that deſerves to be noticed, which is the effects they produce on the ſoil. It ſeems probable, both from the nature of the root and the large portion of manure that is neceſſary to inſure a good crop, except under particular circumſtances of the land, that the potatoe is a ſort of plant that has a tendency to draw a large quantity of nouriſhment from the ſoil on which it is grown, conſequently to exhauſt and impoveriſh it in a conſiderable degree, though theſe injurious effects are in ſome meaſure counteracted by the great abundance of ſtem and the cloſeneſs of the foliage, producing a ſtagnated ſtate of the air, and a conſiderable depoſition of vegetable and other matter on the ſurface, as well as by the pulveriſation and aration that is afforded in the culture and removal of the crop from the ground. It is perhaps in this way only that the

* Darwin's Phytologia, p. 450.

contradictory accounts of the effects of this ſort of crop on the ſoil, and the occaſional ſucceſſive production of full crops on the ſame land, can be well reconciled. The experience of potatoe cultivators in general appears, indeed, to ſupport the concluſion; as upon the more ſtrong and heavy ſorts of ſoil, where benefit can be produced in the above manner, full crops may often be taken in ſucceſſion without much injury being ſuſtained; while on the lighter kinds, where much leſs advantage is derived in this way, they become too open and exhauſted for the ſucceſsful repetition of this ſort of crop, and even for the growth of wheat *. And in Mr. Young's trials with the potatoe, introduced in a great many different courſes of crops, it was found that the ſtate of deterioration of the ſoil was in proportion to the frequency of the occurrence of ſuch crops in the rotations †. The experience and obſervation of the writer of the Agricultural Report of the North Riding of Yorkſhire, however, incline him to the opinion that this kind of crop does not impair the fertility of the ſoil on which it is produced; as he has found the grain crops after the potatoes, and thoſe of the graſs ſeeds in ſucceſſion to the grain, equal to ſuch as ſucceeded crops of turnips ‡. The nature of the land to which his practice and obſervation were confined is not, however, mentioned.

On the whole, it may probably be concluded with ſafety that, notwithſtanding the property which crops of this nature poſſeſs of mellowing and rendering the ſoil more looſe and friable, they rob it of much fertility, and of courſe ſhould not be often repeated, or have grain crops too frequently cultivated after them, without the ground being repleniſhed either by an adequate proportion of manure, or by being laid down to the ſtate of graſs ‖.

It is alſo obvious from the circumſtances that have been mentioned, that potatoe crops are only proper and advantageous as a preparation for wheat in the ſtiffer and more heavy ſorts of land, on the lighter affording a ſtate of ſoil more ſuitable for turnips, barley, and other crops that require the land to be looſe and porous.

It has been ingeniouſly ſuggeſted, that much of that waſte may be prevented which ariſes from the digging up of potatoe crops before they arrive at a ſtate of perfect maturity, as is often done by ſmall cultivators, by taking up ſuch of the roots as preſent themſelves near the ſurface with care by the hand, as in

* Young's Annals of Agriculture, vols. XX. & XXIII. † Ibid vol. XXIII.

‡ Tuke's Corrected Report of the North Riding of Yorkſhire.

‖ Marſhall's Rural Economy of Yorkſhire.

that way the part of the crop that remains will be improved inſtead of being injured.

Turnips.—The introduction of this root into field culture has produced conſiderable alterations and improvements in the management of arable land, as well as in the feeding and maintaining of different kinds of live ſtock. It has contributed to leſſen the neceſſity, and remove the loſs ſuſtained by the practice, of making naked fallows, and at the ſame time provided an abundant ſupply of food for the ſupport and fattening of cattle, ſheep, and other animals. In this combined view, it may of courſe be conſidered as forming the baſis of the preſent improved huſbandry on all the more light and friable loamy ſoils, where its cultivation can be ſucceſsfully carried on upon an extenſive ſcale; the nature of the plant and that of its culture retaining the land on which it is grown in a perfectly clean condition, and under a ſtate of admirable preparation for various crops, but particularly ſuch as require a fine, mellow, and well-pulveriſed bed of earth to grow in, as barley, graſs-ſeeds, and many others.

The turnip has a roundiſh fleſhy root, which differs greatly in form and colour according to the circumſtances of ſoil, ſituation, and culture; but the varieties that have been principally cultivated in the field in different parts of the kingdom are thoſe of the *round* and *long rooted* kinds.

The firſt ſort, which varies greatly in colour both in the root and top, has commonly a round flattiſh root, and is diſtinguiſhed by cultivators into the *round red* or *purple topped*, the *green topped*, the *white topped*, the *yellow*, the *black* or *red rooted*, the *ſtone*, and the *Dutch turnip*.

The ſecond ſort, inſtead of having a round ſhape, and ſpreading ſomewhat flatly on the ground, as in the above kind, has a longiſh cylindrical form, and is known to agricultors under the titles of the *tankard*, the *tap rooted*, and the *pudding* turnip.

All the varieties of the firſt kind, from their roots being formed more in the earth than thoſe of the ſecond, which often ſtand naked above the ſurface of the ground, are better adapted to the purpoſe of being cultivated in the field, where there is danger of their being expoſed to the ſeverity of froſt; but in other caſes, as for providing food at an early period for the ſupport of ſuckling ewes, or the fattening of ſuch ſheep as are forward, the latter may be the moſt advantageous and proper, as they are ſaid to be adopted with ſucceſs in theſe intentions in the practice of Hertfordſhire *.

* Banniſter's Synopſis of Huſbandry.

The cultivators in different diſtricts prefer different varieties of the firſt ſort; but where the ſituation is open and expoſed, thoſe that root deep or ſtand moſt in the ground ſhould probably be choſen, eſpecially where they are to be uſed in the winter ſeaſon without being previouſly drawn and preſerved, as experience has ſhewn that they are the moſt ſecure from the danger of froſt. The green topped and white topped are generally eſteemed more ſweet and nutritious than the red topped, which poſſeſſes a degree of bitterneſs, and is apt ſoon to become ſtringy. The white topped, on the better kinds of ſoil, is perhaps the moſt proper and advantageous; as, while it has the property of being hardy, it grows to a large ſize. This and one of the ſtone or ſmall hard ſort are the moſt commonly cultivated, and held in the higheſt eſtimation in ſome of the beſt turnip diſtricts in the northern parts of the kingdom. The latter is ſuppoſed by ſome Northumberland cultivators to ſtand the ſeverity of the winter ſeaſon much better than moſt of the other ſorts; but that the produce on the acre is conſiderably leſs *. And by others it is believed to bulb quicker, have a greater ſpecific gravity, a finer grain, a thinner ſkin, and to be ſmoother in the crown of the bulb, conſequently leſs liable to injury from wetneſs and ſevere froſt. And that though it may not grow to quite ſo large a ſize, that defect may be obviated by leaving the plants a little thicker on the ground at the time of ſetting them out by the hoe †. The common white turnip is, however, much cultivated in this as well as moſt of the ſouthern diſtricts where the turnip huſbandry prevails ‡. The green topped turnips have been much recommended by others, both on account of the qualities juſt noticed, and their being of a large growth, and continuing long in a ſtate fit for uſe ‖. The yellow or ſtraw-coloured turnip is firm and ſweet taſted, but has not yet been ſo much cultivated as the other varieties, ſo that its properties are not ſo perfectly known. The red ſort was formerly much in eſteem by farmers, but has now moſtly given way to other ſorts: and the black rooted is very rarely cultivated. The early Dutch is but ſeldom grown, except in the garden. Where an early crop is required it might, however, probably be employed with advantage.

The ſoils that are moſt adapted to the turnip huſbandry are thoſe of the light loamy or deep medium ſandy kinds; but it may be practiſed on thoſe of a thin, gravelly, or chalky nature, and even on loamy clays, in ſome caſes when not too

* Corrected Agricultural Report of Northumberland, p. 81.

† Corrected Agricultural Report of the North Riding of Yorkſhire, p. 146.

‡ Donaldſon's Modern Agriculture, vol. II.

‖ Martyn's Edition of Millar's Dictionary, art. *Braſſica Rapa.*

retentive of moiſture, with advantage, provided proper attention be paid in the preparation and manuring of ſuch lands. It is evident, indeed, from the ſucceſsful culture of this uſeful root upon lands that differ greatly in their qualities, that it admits of more latitude in regard to ſoil than many other plants; though the opinion ſeems to have been too general among farmers, that it is only capable of being introduced with benefit on ſuch as are of a very light and friable texture. This has probably had conſiderable influence in preventing the cultivation of the turnip root from becoming ſo general, as from its great utility and importance it ought to have been at this period.

But though the turnip may be grown to advantage on ſoils that vary in a conſiderable degree in reſpect to their natural friability and compoſition, it is conſtantly neceſſary to the healthy vegetation and ſucceſs of the crop, that at leaſt the more ſuperficial parts of the land, or the bed in which the ſeed is to be depoſited, be brought into as fine a ſtate of reduction or pulveriſation as poſſible; as more is found from experience to depend upon this being effectually performed, than even on the richneſs of the ſoil *. This is uſeful in different ways: as, by its promoting the growth of the ſmall ſeed weeds, they are capable of being more perfectly eradicated, and the young turnip plants of courſe leſs endangered by them; while, at the ſame time, a more fine and mellow bed is provided for the reception of the ſeed, and its vegetation rendered more quick and vigorous in conſequence of the more equal diffuſion of moiſture that muſt thus take place. In order fully to effect theſe objects, it is the practice in thoſe diſtricts where the turnip huſbandry is carried on in the moſt complete and ſucceſsful manner, when the ſeed is put in on a fallow, to have recourſe to four, and frequently five, ploughings, having the cloddy parts of the land well broken down in the intervals, by harrowing in different directions and the occaſional uſe of the roller, as by theſe means almoſt every particle of the ſoil becomes expoſed to the influence of the atmoſphere, and is perfectly aerated and ſaturated with moiſture. The firſt earth being given towards the cloſe of the year in a ſhallow manner, ſo as merely to ſkim off the rough ſurface, it may then remain in this ſituation till about March, when it ſhould be well reduced by harrowing, and croſs-ploughed to the full depth. If weedy, it is to be again broken down by the harrow in the courſe of about a fortnight; but, when clean, it is better to remain in its rough ſtate. It may then be left in this condition till about the middle of May, when it ſhould have another ploughing to the full depth; and,

* Modern Agriculture, vol. II.

when the ſeaſon is dry, and the ſoil of the more ſtiff kind, immediately harrowed, but where it is light this may be deferred for a week or more. Theſe repeated operations, when well performed, generally bring the land into a perfectly fine and clean condition; but if that be not the caſe, more muſt be had recourſe to *. Other cultivators, however, adviſe the firſt ploughing to be to the full depth, and that the after-ploughings and harrowings be continued to the middle of June †. Theſe muſt, however, in general be regulated by the nature of the ſoil, the circumſtances of the ſeaſon, and the convenience of the agricultor. But when the ſeed is put in after grain, early peas, tare, or other ſimilar crops, the preparation is ſeldom extended to ſo many ploughings. In ſome diſtricts two ploughings and harrowings, the ſtubble and weeds being at each operation brought together and conſumed on the land, are found ſufficient with the ſeed earth ‡. In others, where turnip crops are made to ſucceed clover or graſs ſeeds, it is the practice to paſture the land in the ſpring with ſheep to ſo late a period as only to admit of ploughing two or three times. And the ſowing of this ſort of crop on old paſture land upon one earth, is likewiſe ſtated as a ſucceſsful practice on the experience of ſeveral years; the method of management in which is to plough the land pretty deep in winter, eating any graſs that may ariſe from the edges of the flags cloſe by ſheep, and afterwards, before the ſeed is put in, reducing it well by harrowing ‖. Theſe are not, however, modes of practice that are in general to be attempted, though they may ſucceed in particular inſtances. But in many caſes, after the ſurface of coarſe paſture and other old graſs lands have been reduced by means of paring and burning, good crops of this root may be grown on one earth, or by once ploughing over the land, the aſhes being previouſly ſpread on the ſurface in as equal a manner as poſſible. The ploughing in theſe caſes ſhould be performed to only a ſlight depth, in order that the crop may derive the fulleſt advantage from the action of the fire and the ſaline principles of the manure on the ſoil.

The principal aim of the agricultor in the culture of this root ſhould conſtantly, however, be that of rendering the ſoil on which it is to be grown as fine and mellow as the nature of the land will admit; as without ſuch cultivation his expectations muſt be frequently diſappointed.

In regard to the application of manure for turnip crops, in the firſt methods

* Kent's Hints, p. 110.

† Corrected Agricultural Report of the County of Suffolk.

‡ Corrected Agricultural Report of the County of Middleſex.

‖ Corrected Agricultural Report of the North Riding of Yorkſhire.

of preparing the land, and where it is of the calcareous kind, as lime, marl, or other ſimilar ſubſtances, it may be the beſt practice to apply it after the ſecond or third ploughings, in the firſt kind, in the proportion of from one and a half to about three chaldrons *; and in that of the latter, from eight to ten or fifteen ordinary cart-loads, according to the circumſtances and nature of the land; as in this way ſuch matters may become the moſt perfectly blended and incorporated with the mold of the ſoil. Lime is ſucceſsfully made uſe of for this crop in Yorkſhire, and moſt other diſtricts where it can be procured. And the uſe of marl has been attended with equal benefit in the county of Norfolk in England, and Angus in Scotland †. The former would ſeem to be the moſt proper on ſuch ſorts of land as are inclined to be in ſome meaſure ſtiff and adheſive.

When dung can be procured, the experience of different cultivators of the turnip, however, ſhew that it is the moſt ſuited to the growth of the root. For ſuch ſoils as poſſeſs a ſufficient degree of lightneſs, and are in a fine mellow condition, that which is become conſiderably reduced by fermentation, or in a more rotten and ſhort ſtate, may be the moſt proper, as it can be the moſt intimately incorporated with them; but where they have greater ſtiffneſs and coheſion, the longer kinds may be more beneficial, as they will not only tend to preſerve ſuch lands in a more open and porous ſituation, but, by their gradual decay in the earth, render them more mellow. Some, however, think it the moſt proper when it is neither in a very ſhort nor very long ſtate, but in a medium condition between ſuch extremes ‡. Compoſts conſiſting of dung and different ſorts of materials, as maiden earth, marl, and the mortary rubbiſh from old walls, in the proportions of one-fifth, well mixed, by having the dung laid over them in the winter, and afterwards blended together more intimately by turning before they are made uſe of, have alſo been employed with ſucceſs ‖. The duſt of malt, or what is frequently termed combs, is likewiſe another ſubſtance that the ſame writer has recommended as an uſeful application in the way of manure in the culture of turnip crops. And the dung of rabbits, pigeons, and poultry, chopped rags, rape cake, river weeds, and other ſimilar matters, may frequently be employed.

Dung, when employed as manure for this ſort of crop, ſhould vary in ſome meaſure in the manner of its application, according to the nature of the land and

* Thirty-two buſhels.

† Corrected Agricultural Report of the North Riding of Yorkſhire; and Donaldſon's Modern Agriculture, vol. II.

‡ Corrected Agricultural Report of Suffolk.

‖ Kent's Hints, p. 112.

the mode in which the root is cultivated: in general, however, it ought to be depoſited in the ſoil as nearly as poſſible to the period at which the ſeed is ſown; as in this method, in conſequence of the new fermentation that muſt take place in the ſoil, the crop may receive the greateſt benefit from it. Where the ſeed is to be ſown in the broadcaſt method, it may, therefore, be ſpread equally over the land, and turned in with the ſeed furrow; though ſome adviſe it to be lightly turned in by the ploughing that precedes the ſeed earth, and to be well incorporated with the ſoil by harrowing juſt before that earth is given*. The former appears however to be the better practice when the dung is in a ſufficiently reduced ſtate, as the plants will have the more full advantage of it. The quantity that is neceſſary muſt depend upon the different circumſtances of the ſoil and the richneſs of the dung; but leſs than ten or twelve good three-horſe-cart loads can ſeldom be employed with advantage. If a compoſt manure be made uſe of, the proportion ſhould probably be much larger. In Norfolk, according to Mr. Kent, they employ ten cart-loads; but in other diſtricts twelve are made uſe of, and in others again it varies from ſix to ten; each containing about thirty buſhels†.

Where the crop is ſown in the drill manner, as it is confined to the middle of the ridges, and does not occupy the whole ſurface of the land, a ſomewhat leſs quantity may be ſufficient. A liberal allowance ſhould, however, always be made, as the ſafety and advantage of the crop depends much upon the rapidity and vigour with which the young plants are puſhed forward by ſuch means. When the lands have, however, been well manured for the preceding crop, the turnip crop may frequently be put in without the uſe of any manure.

In whatever method the dung is made uſe of, it ſhould conſtantly be ſpread out evenly, and turned into the ſoil with as much expedition as poſſible; as where this is neglected much loſs muſt be ſuſtained by evaporation, eſpecially when the ſeaſon proves hot and droughty.

When malt-duſt or combs is had recourſe to, the quantity that is commonly applied is about twenty ſacks, of three heaped buſhels each, to the acre ‡.

The dung of birds in its dry and reduced ſtate, and other ſubſtances that have a powdery form, when uſed for this ſort of crop, are moſtly laid on in the proportion of from about twenty to thirty buſhels to the acre §.

* Kent's Hints, p. 112.

† Corrected Agricultural Reports of the Counties of Suffolk and Yorkſhire.

‡ Kent's Hints. § Synopſis of Huſbandry.

In applying ſuch manures, as they require only to be put into the ſoil to a ſlight depth, harrowing in many caſes may be ſufficient for the purpoſe; which ſhould be done juſt before the ſeed is ſown, care being taken to have them firſt diſperſed in an equal manner over the land.

Rape cake, when brought into a powdery form by mills * conſtructed for the purpoſe, is ſtated to have been uſed in Norfolk by Mr. Styleman, an intelligent cultivator, with much ſucceſs, in the proportion of a quarter of a ton to the acre †; the powder being placed over the ſeed in the drills by means of Mr. Cook's drill machine, merely by ſubſtituting proper cups and funnels. When river weeds, which have been tried with ſucceſs in the ſame county by Mr. Coke and Mr. Branthwaite, are made uſe of, they are laid on the ground in their wet ſtate immediately after being removed from the water, and as ſoon as poſſible turned in by a light furrow. This ſubſtance, from the danger of the vegetation of the ſeeds, can probably only be uſed with propriety on ſuch ſoils as are of a very dry quality ‡.

There is ſtill another method of providing and applying manure for this crop, practiſed in ſome diſtricts ‖; which is that of folding ſheep on the land after the firſt ploughing of it up, until the ſeed earth is given. As the treading of the animals may often be apt to render the land ſo hard and compact as to be afterwards reduced to the proper ſtate of pulveriſation with difficulty, it may be the beſt practice in ſuch caſes only to uſe the fold in dry weather, always ploughing the ground lightly over as ſoon as poſſible after the ſheep are removed.

Quantity of Seed.—It is difficult to aſcertain the proportion of ſeed that may be requiſite in different caſes, as much muſt depend on the nature of the ſoil, the period of ſowing, and the methods and circumſtances under which it is put into the ground. In Norfolk, where this ſort of huſbandry is carried to a conſiderable extent in the broadcaſt method, it is generally from about one pound to a pound and a half; while on the ſandy lands in Suffolk, and thoſe of the lighter kind in Yorkſhire, a pound or pint is found to be ſufficient. But on the turnip ſoils in Middleſex nearly two pounds are employed. It is always,

* The mills employed for this purpoſe, according to Mr. Kent's Report, are conſtituted each of two cylinders revolving towards each other: the firſt breaking the cake into pieces of the ſize of a walnut by means of cogged cylinders; while the other reduces it into powder by plain cylinders ſimilar to thoſe employed in reducing clay for the forming of bricks.

† The expence in 1796 was not more than 1l. 5s.

‡ Corrected Agricultural Reports of Suffolk.

‖ Corrected Agricultural Reports of Norfolk and Hertfordſhire.

however, a good practice in ſowing turnips not to be too ſparing in the uſe of ſeed, as the unneceſſary plants may be eaſily thinned out at the time of firſt hoeing over the crop. The calcareous or chalky ſoils, in general, require the largeſt proportions of ſeed.

But in cultivating the root in the drill method, as the ſeed is delivered with more correctneſs, and the whole of the ground is not to be occupied by plants, ſome ſaving may be made in the quantity of ſeed made uſe of.

As much of the ſucceſs of turnip crops is found from experience to depend on the quick vegetation of the ſeed, and the plants puſhing expeditiouſly into broad leaf, it may be a practice of great utility in theſe views to have the ſeed ſteeped a few hours in water or ſome other liquid, before it is committed to the ſoil. When the ſeaſon is dry, this will be particularly neceſſary. In the trials we have made in the garden practice, the ſteeped ſeed has conſtantly ſucceeded; while that which has been ſown without immerſion has frequently failed.

Time and Methods of Sowing.—The periods of putting crops of this nature into the ground muſt be principally regulated by the intentions of the cultivator in regard to the diſpoſal of the produce. For the general more early conſumption of the root, the moſt proper ſeaſon for performing this operation may be about the beginning of June; but when it is intended that the crop ſhould ſerve as food for animals in the early ſpring months, it is a better practice to delay the ſowing till towards the beginning or middle of July. When the root is, however, cultivated upon an extenſive ſcale, it may be advantageous to vary the times of putting the ſeed into the ground more conſiderably; as by ſuch means the plants not only come more in ſucceſſion to the hoe, but likewiſe for the purpoſes of conſumption*.

In ſome diſtricts, as thoſe where the practice of lamb-ſuckling is carried on, very early crops are occaſionally required; in which caſes the ſeed is generally put into the ground as early as poſſible in the month of May; ſuch land as is in a fine ſtate of tilth, and perfectly clean from weeds, being choſen for the purpoſe.

In general, however, the early-ſown crops of turnips are not only leſs ſweet and nutritious, but more expoſed to injury from mildew and other cauſes, than thoſe that are put in later; but, notwithſtanding this, the ſowing ſhould not be deferred ſo long as that the plants cannot have time to cover and fix them-

* Modern Agriculture, vol. II.; and Corrected Agricultural Report of the North Riding of Yorkſhire.

ſelves well in the ſoil before their growth is reſtrained by the coldneſs of the autumn and winter ſeaſons.

There are different methods practiſed of putting this ſort of crop into the ſoil in different diſtricts: in moſt of the ſouthern counties it is the more general practice to ſow turnips in the broadcaſt manner on the level ſurface; while in the northern parts of the iſland, where this ſort of huſbandry has been conſiderably improved, it is the more uſual method to employ the drill machine, depoſiting the ſeed in rows, either on ridges formed by one bout of the plough, or on the level ſurface; at the diſtances of from twenty-four to thirty inches in the ridge method, according to the circumſtances of the ſoil and the intentions of the cultivator, and from ten to twelve or thirteen when on the plain ſurface.

It is probable that both theſe methods may be had recourſe to with advantage under different circumſtances of the land. On the very light, deep, ſandy, or gravelly ſoils, that are apt to part with their moiſture quickly, and of courſe become too dry and parched for the healthy growth of the turnip plant, it may be the moſt ſucceſsful practice to put the ſeed in in the broadcaſt method on the level ſurface, as by ſuch means the neceſſary proportion of moiſture may be better preſerved for the ſupply of the crop.

But where the ſoils are of a rather more heavy quality, and not ſo liable to part with their moiſture, the ridged drill method, by the pulveriſation which it affords, as well as its tendency to preſerve the plants from being injured by the ſtagnation of too much moiſture about their roots, may be the moſt proper and uſeful. And beſides being more beneficial in theſe ways, it poſſeſſes advantages in other reſpects; as on the thinner-ſtapled ſoils the turnip, on account of its long tap-root moſtly requiring a depth of mold of ten or twelve inches, can ſeldom be grown in a perfect manner. The ridging up of the land may be of utility in providing a more ſuitable depth of cultivated ſoil, and better bed for the reception of the ſeed, the operation having been found to more than double the ordinary depth of mold of ſuch grounds. It may likewiſe be added, that the manure, from its being merely confined to the ridges, is leſs expoſed to the weather, and need not be employed in ſo large a proportion, conſequently a greater extent of land be converted to the production of this crop; while, by its concentration, and the ſeed being placed immediately upon it, the nouriſhment and ſupport of the crop may be more effectually promoted, and a larger produce afforded: and, for the purpoſe of early ſowing, and being eaten off in the winter months, ſo late as January, it may alſo be preferable, as the turnips can

be more readily obtained for the cattle when there is a conſiderable depth of ſnow upon the ground *. There are alſo other circumſtances in this mode of cultivating turnip crops, that appear of importance: the hoeing and cleaning of the rows can be more eaſily performed, and in a more perfect manner, women or children being capable of being employed in the buſineſs; while the weeds in the intervals are capable of being eradicated, and the mold laid up to the plants by the plough. And it has been even ſuggeſted by ſome, that the danger of ſheep, from being caſt in the furrows, is conſiderably leſſened if not wholly obviated; as on one-bout ridges they cannot lie down on their ſides, or roll on their backs, as is frequently the caſe in the other methods †: though others think the contrary the caſe, and recommend conſtant attention while the ſheep are feeding upon them ‡. From the narrowneſs of the furrows in ſuch caſes, the firſt concluſion would ſeem to be well founded.

The only objections to the raiſed drill method that appear to have much weight are, that from the root being more elevated and expoſed, it is not ſo capable of ſtanding the ſeverity of the winter; and that larger ſpaces are allowed than are neceſſary for the roots to attain a ſufficient ſize, conſequently that the quantity of produce will not be ſo great. It would ſeem probable, however, that from the paſture of the plants being greatly enlarged, and the crops thereby rendered more healthy and vigorous, the amount of produce muſt be rather increaſed than leſſened ‖. It has alſo been contended, that in the raiſed method there is a difficulty of reducing the land to a level ſtate again; and that the ground in the intervals becomes unproductive from not having the advantage of manure: it is obvious, however, that by making the ridges in a proper manner, according to the nature of the land, theſe inconveniences may eaſily be avoided.

* Jobſon in Communications to the Board of Agriculture, vol. II.

† Middleton's Corrected Agricultural Report of Middleſex.

‡ Tuke's Corrected Agricultural Report of the North Riding of Yorkſhire.

‖ It is obſerved by a cultivator in vol III. of the Farmer's Magazine, who has long paid great attention to the difference in turnips raiſed in drills with broad intervals and thoſe produced in other modes, that they arrive at a much greater ſize in the former than in any other method which he has ſeen. In judging of the weight of ſuch crops by the acre, it is the opinion of many, that the largeneſs of the turnips is not to be ſo much attended to as the greatneſs of their number. This he ſuſpects may have led to erroneous concluſions. But taking the intervals in the narrow method at about thirteen inches, and the diſtance of the plants in the rows at about twelve, an acre will contain about 40,200 turnips: and in the raiſed drill method, at the width of twenty-ſeven inches in the intervals, and the diſtance of about eleven in the rows, the ſame ſpace of land will contain about 21,100. And that in

On dry level grounds it is adviſed in this view to have the drills in a diagonal direction over the field; and where the ridges are high, directly acroſs them, the plough being drawn down the furrows to diſcharge the water.

It has likewiſe been adduced as an additional inconvenience in the raiſed drill method, that where the lands are of the more wet and heavy kinds, and have but little declination of ſurface, though larger crops of turnips may be produced, the grounds are ſo much injured by being pouched in conveying them off, that the grain crops which follow will be diminiſhed in a larger proportion than can be compenſated by the extra value of the turnips. In ſuch caſes it is, therefore, recommended as more advantageous to form the land into ridges, ſufficiently rounded to convey the water with facility into the furrows, and of ſuch breadths, as about fifteen feet, that a cart can be eaſily conducted along them without preſſing the earth in and obſtructing theſe furrows; the ſeed, where the land is diſpoſed to the throwing up of annual weeds, being put in drills on their ſurfaces, as by that means the buſineſs of hoeing may be rendered more eaſy: but where this is not the caſe, and where the ſowing is performed at a late period, or the land is infeſted with the grub, the broadcaſt method may be preferable, as being more certain from the circumſtance of the plants being left ſo near to each other at the firſt hoeings as to admit of thinning and the removing of ſuch as are weak and unhealthy at the ſucceeding operations. Beſides, they are ſuppoſed to have the advantage of growing more

reſpect to the *real* ſize of the turnips, he has no doubt of being ſupported by the generality of the moſt experienced cultivators in maintaining, that when the various circumſtances of *ſoil, climate, ploughing, manuring, ſeed, time of ſowing,* &c. *are equal,* that where thoſe in the drills with narrow intervals grow to ſix inches diameter, thoſe in the drills with broad intervals will grow to eight and a half inches *upon an average.* Now, ſays he, as ſimilar ſolids are in a triplicate *ratio,* the weights of the turnips will be as the cubes of their diameters, or as 216 is to 614; as *experiments in weighing will prove* where the turnips are ſpherical, which is moſtly the caſe in the beſt kinds. Hence the weight of the 40,200 to that of the 21,100, is as 86 to 129 nearly; and, conſequently, when the latter are worth 6*l.* the acre, the former will only be worth 4*l.* 5*s.* As it may be objected that he has taken the turnips in the former mode *ſmaller* and in the latter *larger* than they *really* are, it is added, that, even ſuppoſing the latter had been taken at conſiderably leſs than eight inches diameter, the 21,100 would have outweighed the 40,200 by about one-eighth part, which is, he ſays, equal to fifteen ſhillings the acre. He is perfectly convinced, however, that the reſults of properly conducted experiments will ſhew that he is right in taking the proportions upon which he firſt calculated.

The concluſion, therefore, is, he thinks, that, beſides the ſaving of expence, and the other important advantages that have been mentioned, the method of cultivating turnips by the drill with wide intervals produces a weight of turnips on the acre greater by about one-third than where the narrow-ſpaced drill plan is followed.

vigorouſly from their ſheltering each other more fully, as well as from the ground being leſs ſtirred about them in the early period of their growth, before their tap roots are ſufficiently fixed to ſupport them *.

It would ſeem, however, from the ſucceſs that has attended the putting in of this ſort of crop by the drill in different diſtricts, and the greater eaſe and cheapneſs with which the after-culture of the crop can be performed, that it is in general the moſt advantageous method; but that at the ſame time it may often be neceſſary to vary the nature of the ridges and the diſtance of the rows according to the quality and circumſtances of the ſoil †.

* Jobſon, in Communications to the Board of Agriculture, vol. II.

† The following are the reſults of an experiment on the weights of ſix different parcels of turnips taken from a field of fifteen acres, which had been ſown in June, 1797, with the view of determining the comparative value of the drill and broadcaſt methods. The whole being in a ſtate of equal tilth, and manured in as equal a manner as poſſible, immediately before the ſeed was ſown, with well-rotted fold-yard dung, in the proportion of about ſeventeen cart-loads to the acre, each containing twenty-eight Wincheſter buſhels; and with the view of rendering the trial as fair and accurate as poſſible, different breadths of land, of twenty yards each, were ſown in the drill and broadcaſt methods alternately throughout the whole: part of the drills being on *one-bout ridges* of twenty-ſeven inches each, and the dung depoſited immediately underneath the rows of ſeed; and the remainder in drills on the level ſurfaces at twenty-one inches diſtance. The produce per acre being calculated on the weight of four ſquare perches, or the fortieth part of a ſtatute acre, of each; the tails or fibrous parts of the roots being firſt cut off and rejected, taking the weights of the tops and roots afterwards ſeparately.

It is added, that though the crop, eſpecially on the drilled part of the field, was not a very good one, being too much thinned and otherwiſe injured by the *grub* after the plants had been finally ſet out, it was found that the turnips on the *one-bout ridges* exceeded the others in weight; the whole being taken from an inferior part of the field, in order to afford a fairer average.

	Times of weighing.	Number upon four ſquare perches.	Weight on four ſquare perches, or the fortieth part of an acre.		Weight per ſtatute acre.		Average weight of each turnip.	Average diſtance of each turnip.
			Roots.	*Tops.*				
			cwt. qr. lb.	*cwt. qr. lb.*	*tons. cwt. qr. lb.*		*lb. oz.*	
No. 1. Drilled on one-bout ridges, at 27 inches diſtance	January	354	8 1 1	1 1 3	19 1 0 20		3 0¼	16½ in. by 27
2. Drilled with Mr. Bailey's machine on a level ſurface, at 21 inches diſtance	Ditto	428	7 1 15½	1 1 5½	17 7 1 8		2 4¼	17 in. by 21
3. Broadcaſt - -	Ditto	568	7 2 12½	1 0 11¼	17 8 1 26		1 11½	16¾ each way
4. Drilled on one-bout ridges, at 27 inches diſtance	March 2	334	8 3 0	1 1 22	20 7 3 12		3 6½	17 by 27
5. Broadcaſt (theſe and the preceding were round white turnips) -	Ditto	628	8 2 22	1 1 8	20 0 2 24		1 12½	16 each way
6. Broadcaſt (red) - -	Ditto	561	6 3 26½	2 3 5	19 11 1 0		1 15¾	16½ ditto

It

In cafes where the broadcaft method of fowing turnip feed is practifed, it is of confiderable importance that the furface of the land be rendered as fine and even as poffible before the fowing is performed, and that the feed be delivered or difperfed over it in a perfectly equal manner, and as foon as poffible after it has been ploughed up; as upon thefe operations and circumftances being properly conducted and attended to, the fuccefs of the crop in a great meafure depends. The latter can feldom be executed by the hand in a proper manner by perfons who have not been in the habit of fowing the fmaller kinds of feeds: but a fort of box, or machine conftructed for the purpofe, is often made ufe of by thofe who have not been much accuftomed to the bufinefs; and, when proper care is taken to fee that the perforations do not become obftructed by two or more feeds being faftened in them, may be extremely advantageous in delivering the feed in an uniform and regular manner.

The feed, after it has been diftributed over the furface in fome of thefe methods, is moftly covered by means of harrowing; a light fhort-tined harrow being the moft adapted to the purpofe, as, from the turnip plant forming its bulb in a great meafure above the ground, it fhould probably not be put in to too great a depth. It has been adviſed in performing this operation to pafs the harrows over the land only twice in the fame direction, walking the horfes in the firft, and trotting them gently in the laft, in order to give a neater finifh; the ridges having been laid out to the breadths of from four to ten yards, according as the foil may incline to moifture or dryneſs *.

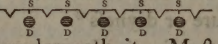
In the drill method of putting in the crop, the land, after being prepared in the manner that has been directed above, is either formed into ridges by the plough, or the drills are ſtuck in the level furface, as has been already noticed.

The manner of performing the firft operation is by a furrow being firft drawn as ſtraight as poſſible down the field, and in returning another furrow from the other ſide being laid up againſt it, by keeping the off-ſide horſe in the firſt made furrow; a ſuitable proportion of land being given to the plough for forming a ridge of proper height, ſomewhat in this way A. The work is then to be

It is obſerved, that by noting the average diſtance of each turnip in the laſt column, it is intended to ſhew at one view how many plants there were wanting in the drills to have made them a full crop; for if 550 be ſtated as a medium number in a full crop upon the fortieth-part of an acre, they will be found to occupy a ſpace of 17 inches each way in broadcaſt, 10½ by 27 inches on the one-bout ridges, and of 13½ by 21 inches in thoſe drilled on the level ſurface; whence it may be eaſily ſeen how much thoſe were wider in the rows than they ought to have been.

* Kent's Hints, p. 112.

continued in a ſimilar method throughout the whole field, which when finally accompliſhed will have the appearance of alternate ridge and furrow, ſomewhat in this manner ΛΛΛΛΛΛΛΛ. A diſtance, as has been obſerved above, of from about twenty-ſeven to thirty inches is preſerved between the ridglets, in order to admit of the plough paſſing between them in the after-culture of the crop, but which in leſs diſtances cannot be the caſe.

After the buſineſs has proceeded in this way, the manure is to be placed in the drills: which is the moſt conveniently effected by employing ſmall carts, and having them to proceed along either every third or every fifth furrow, depoſiting it in ſmall heaps in them; proper perſons with ſmall three-pronged forks being ſtationed ſo as to follow and place it in an even and regular manner in the bottoms of the three or five furrows, or thoſe in which the manure is dropped from the carts and thoſe on each ſide of them. After this has been accompliſhed, the ſmall ridges before thrown up are ſplit down, the earth from each covering the manure up in the middle, ſo as to form new ridges in the ſame manner as before. The tops of theſe ridges are then to be flattened by ſome means or other: the moſt common is a ſmall light roller, that paſſes along two of them at once. The turnip ſeed is then put in exactly in the middle of the flattened parts of the ridges, by means of a drill contrived for the purpoſe, and which is frequently faſtened to the flattening roller by a rope ſix or ſeven feet in length, and directed behind by a perſon for the purpoſe. The buſineſs, when finiſhed, appearing in this way  ; S repreſenting the ſeed, and D the manure immediately underneath it. Moſt of the drill barrows are implements that may be attached to the ploughs in the ſame manner. The rollers and drills are moſtly drawn by a ſingle horſe, driven by a boy; but the perſon that regulates the latter may alſo direct the horſe, when it is properly trained and accuſtomed to the work*. Sometimes, inſtead of the roller, a kind of ſled, made of wood or iron, is employed for flattening the ſurface of the one-bout ridges; but a light roller ſeems to be the neateſt and moſt convenient implement.

The operations of forming the ridglets and incloſing the manure in them, are generally, in the northern diſtricts, performed by a common light ſwing-plough; but they may probably be accompliſhed with greater expedition and regularity by a light double-mold-boarded plough.

* Corrected Agricultural Report of Northumberland.

For the purpoſe of putting in the ſeed, drill machines of both the barrow and other kinds are employed; but thoſe that are attached to the plough or roller, and of courſe perform the different operations of ploughing and ſowing at the ſame time, are, perhaps, in general to be recommended. Great attention is, however, conſtantly neceſſary, to ſee that the ſeed be regularly diſperſed and depoſited in the ſoil; as, from the ſmallneſs of the perforations in the revolving cylinders of moſt of ſuch machines, the ſeeds are liable to be obſtructed, and the regularity of the ſowing thereby prevented.

But where the drills are formed upon the level ſurface without being raiſed, which is the practice in ſome diſtricts, and eſpecially when made at narrow diſtances, as twelve or thirteen inches, the larger ſort of drill machines, which ſow a number of rows at a time, may be had recourſe to with advantage, as being more expeditious *.

In whatever manner the turnip ſeed may be put into the ground, experience has ſhewn it to be of much importance to have it depoſited in the ſoil in ſuch a way, and under ſuch circumſtances, as that its germination and early growth may be as expeditious as poſſible, as upon this the ſucceſs of the crop in a great meaſure probably depends.

It has been maintained by ſome, that the ſeed, in order to ſecure theſe effects in the moſt certain manner, ſhould be placed in the ſoil to the depth of three or more inches: and they have contended, that the ſuperiority of the drill method partly ariſes from the ſeed being depoſited to a greater depth, and growing more rapidly in conſequence of having more moiſture, ſo as to become ſooner out of danger from the fly or other inſects †; while others, from the circumſtances that have been noticed above, think that it ſhould be covered only in a light manner ‡.

As it has been already ſhewn that air is neceſſary as well as moiſture to the vegetation of ſeeds when placed in the ground, it would ſeem probable that the quick vegetation of ſuch crops may be the moſt effectually ſecured by only putting them in to a middling depth, and according to the particular nature of the land and ſtate of the ſeaſon, as from an inch and a half to two or more inches, as the ſoil or ſeaſon may be inclined to be dry or the contrary. In this way, the inconveniences ariſing from the ſeed being too much exſiccated by its expoſure near the ſurface, and from the want of the action of the air on account

* Section on Implements.

† Exter, in Tranſactions of Society of Arts, vol. XVI. p. 191.

‡ Corrected Report of the North Riding of Yorkſhire. Note.

of its too great depth, may be equally obviated. But as crops of this ſort are moſtly put into the earth during the hotter months, there is another circumſtance that may be of equal conſequence in promoting the quick growth of the young plants; which is, that the ſeed, eſpecially in dry hot ſeaſons, be in a great meaſure ſaturated with moiſture, and of courſe with the oxygenous principle of the air, before it is committed to the ground; as by ſuch means theſe will not require to be drawn from the ſurrounding mold, but the proceſs of vegetation almoſt immediately commence. In the culture of this root in the garden, by adopting ſuch methods, we have not, even where the ſeed was ſown in the hotteſt ſeaſons, failed having good crops; as the plants, from the quickneſs of their growth, are but little expoſed to the attacks of the fly, it being chiefly ſuch only as from their weak and imperfect growth become ſweet and tender that are devoured by this deſtructive inſect*.

* It is obſerved by the Rev. H. B. Stacey, in an uſeful pamphlet on the failure of turnip crops, that the firſt proceſs towards vegetation in this ſeed is its ſwelling, by having imbibed a certain quantity of moiſture: it is then able to exert its vital powers; and, in order to ſecure its future increaſe, when the demand for nouriſhment is in proportion to its growth, it ſends forth its radicle or little root, which as it lengthens begins to branch out, being covered with very fine hairs reſembling down; which, by ſowing a ſingle ſeed cloſe to the inſide of a glaſs veſſel filled with moiſt earth, may be eaſily obſerved. And that when the radicle has proceeded about half an inch, it ſends forth its germ, conſiſting of the ſtem and ſeed-leaves, with the bud of the future plant in embryo. Theſe ſeed-leaves are ſuppoſed to contain proper nouriſhment for the plant during the firſt ſtage of its growth; the radicle being then too ſmall and weak to furniſh food ſufficiently delicate. That every injury, therefore, done to theſe leaves, either from being punctured by inſects or deprived of a ſupply of moiſture, muſt aſſiſt in checking the growth of the plant. And further, after ſuſpecting heat and dryneſs to be the principal cauſes, that where the ſeed is ſown in ſuch ſeaſons there is ſcarcely ſufficient moiſture to cauſe it to ſprout; and that unleſs it be depoſited to ſuch a depth as that it may be ſcreened from the action of the ſun, its vegetative powers may be deſtroyed. But though a great part of it may imbibe ſufficient moiſture from the dews and dampneſs of the ſurrounding earth during the night ſeaſon to render it capable of vegetating, its progreſs muſt be retarded by the heat of the ſucceeding days; and by being thus alternately moiſtened and dried, its vital principle be much impaired, if not entirely deſtroyed. And even if, as is ſometimes the caſe, the ſeed finds moiſture ſufficient to enable it to produce both its radicle and germ, and even to raiſe its ſeed-leaves above the ſurface of the ground, ſtill the ſame deſtructive effects may be ultimately produced; the heat then exerting its influence on the external parts of the plant, by evaporating its moiſture faſter than it is ſupplied by the radicle, by which it either withers away, or is ſo much injured that it never completely recovers itſelf; and that there is no doubt but that many acres of turnips are annually ſpoiled in this way.

In proof of the above, though it is admitted that turnip crops may be materially injured by the ravages of inſects, the following experiments were made:

In

The general ſucceſs of agricultors in raiſing theſe crops, by putting the ſeed in immediately after the plough, while the ſoil is in a moiſt condition, not only proves the correctneſs of theſe principles, but ſhews that great utility may be derived from ſteeping the ſeed in ſome watery liquid before it is committed to the ground whenever the ſeaſon is hot, and the ſurface of the land in a very dry and parched ſtate; as by ſuch a practice good crops of turnips may frequently be produced, where they would otherwiſe almoſt wholly fail. The preſervation of the turnip crops in China have, indeed, lately been chiefly aſcribed to this practice *. And in farther confirmation of the practice, it has been contended, that when the ſeed is ſown in the time of rain, or when it quickly ſucceeds the ſowing, the plants grow ſo rapidly as to receive no injury. On the ſame principle, as has been already noticed, it has alſo been maintained, that, by putting the ſeed in deeper than in the ordinary broadcaſt method, as by depoſiting it in drills, a more certain crop is produced, from the circumſtance of the plants proceeding in their growth with greater rapidity †. As it has, however, been ſhewn that the atmoſpheric air has much effect in promoting the quick vegetation of moſt ſorts of ſeeds when put into the ground, care ſhould be taken, as has been ſhewn above, not to place them at ſuch a depth as that it may be prevented from affording its moſt beneficial influence.

After-Culture.—On this part of turnip huſbandry being performed in an effectual manner, and at ſuch periods as are the moſt ſuitable for promoting the

In hot dry weather, in the year 1793, ſome turnip ſeed was ſown in ſhallow drills, drawn by a hoe, on a light poor ſoil; and notwithſtanding the fly was accuſed of having deſtroyed many crops in the adjoining grounds, the ſeed came up and produced a good crop. And in 1794 the ſame experiment was repeated with ſimilar ſucceſs, although the fly was more general than in the former year.

But in order to aſcertain whether any advantage would be derived by ſowing the ſeed deeper, under an idea that the germ would require more time to force its way to the ſurface, and the radicle at the ſame time be increaſing its power downwards, and conſequently be more capable of withſtanding the ſun's heat, thirty-two turnip ſeeds were ſown at different depths, in glaſs veſſels filled with common garden mold, and plunged into the earth; on the fourth day after ſowing they were examined, and the reſults were as follow:

The ſeed ſown at 4 in. depth, had ſhot forth a radicle, 3 in. long, a germ 1 in.				
3 ditto	ditto	2½ ditto	ditto ⅞	on an average.
2 ditto	ditto	2 ditto	ditto ¾	
1 ditto	ditto	1½ ditto	ditto ½	

* Sir George Staunton's Embaſſy to China, vol. III. p. 310, 8vo. edit.; and Gillet in Bath Papers, vol. II.

† Exter, in Tranſactions of the Society of Arts, vol. XVI.; and Stacey's Obſervations, p. 20.

growth of the young turnip plants and preventing thoſe of the weed kind from injuring them by the obſtruction and ſhade which they produce, much of the ſucceſs of the crops muſt in general depend; as, without conſiderable attention in this reſpect, the labour and expence that have been employed in preparing the ſoil and putting in the crops muſt in a great meaſure be thrown away, the produce being ſeldom ſufficient to repay the cultivator in an adequate manner. This culture is to be accompliſhed by means of the hoe. Where the crop has been put into the ground in the broadcaſt method, the hand-hoe only can be employed; but where the ſeed is ſown in rows by the drill, and a ſufficient ſpace of interval allowed, thoſe of the horſe kind can be made uſe of, either alone, or in addition after the plants have been properly thinned out in the hand method. It is uſual when the plants have produced four or five leaves, or when they cover a circle of from three to four inches in diameter, which, in kindly ſeaſons, will moſtly happen in about a month or ſix weeks from the time of ſowing, to begin theſe operations. In the firſt of which, ſuch plants as ſtand too cloſe muſt be thinned out to a ſuitable diſtance, according to the circumſtances of the ſeaſon, the nature of the ſoil, the period of ſowing, and the uſe to which the crop is to be applied. When the ſeaſon is hot and dry, the thinning in the firſt hoeings ſhould not be to too great a diſtance; as by keeping the plants pretty cloſe together the moiſture of the land may be better preſerved, and the crop rendered more ſecure: but in rich ſoils, when early ſown, and when intended to be conſumed by cattle at an early period, more thinning may at firſt be advantageous. The moſt uſual cuſtom is to leave the plants in the firſt hoeings at the diſtance of from ſix to eight inches from each other; and ſome cultivators prefer a ſtill greater diſtance *. In the ſecond hoeing, which ſhould be performed in the courſe of about a fortnight or three weeks from the firſt, according as there may be neceſſity, the plants that are to remain for a crop may be left at the diſtance of from ten to twelve or fourteen inches in the broadcaſt practice; and at thoſe of from nine to fifteen, or ſometimes more, in the rows where the drill ſyſtem is employed.

In the ſecond hoeings, the mold between the plants ſhould always be well ſtirred, in order that it may be perfectly aerated, and any weeds that may have riſen be effectually deſtroyed. The future hoeings of crops of this kind muſt be regulated by the particular circumſtances of the caſes; but the mold ſhould never be allowed to become too compact about the roots of the plants, or weeds ſuffered to interfere with the crops.

* Kent's Hints.

In the county of Northumberland, where the turnip culture is performed in a very perfect manner, it is the general practice in the drilled crops, as they have so much room laterally, to leave them at not more than eight or nine inches apart in the rows. In performing the operation, the labourers proceed sideways, pulling the surplus plants and weeds into the hollow intervals between the one-bout ridges, the plants being left perfectly regular in the rows. The work is accomplished with much ease and facility by women or children.

After this, when the turnip plants become perfectly established again in the soil, which is mostly the case in about eight or ten days, the earth is taken from the rows where the turnip plants stand, by a light plough contrived for the purpose, and turned upon the plants and weeds left by the hand-hoes in the intervals of the ridges. And when they have recovered themselves from this operation, and are become again in a vigorous condition, or when other circumstances render it necessary, the mold, which was in the former process turned from the turnip rows, is now divided and laid up equally to the different rows by the same implement, or a similar one with a double mold-board. In this way, where the land is clean and free from weeds, the business is completed; but when the contrary is the case, additional hoeings and ploughings must be given according to the state of the land *.

With some cultivators it is a practice to pass a light harrow over the land once in a place, as soon as the plants are sufficiently strong, in order to render the first hoeing more effectual; and even in particular cases, where they push forward rapidly, it is made use of a second time in the contrary direction †. In performing this business, great care is, however, necessary, especially where the plants are thin upon the ground; otherwise too many of them may be dragged up and destroyed.

It has been observed, that, by having the seed put into the ground at different periods, great advantage may be obtained in the hoeing of the crops; it having been found that, by adopting such a practice, six labourers are capable of accomplishing the work twice over one hundred acres or more, while in the contrary case a much larger number will be required ‡.

It is obvious that the hand-method of hoeing turnip crops, which is the only method that can be employed where the broadcast plan of sowing is pursued, is not only much more troublesome and expensive, but more confined and less

* Corrected Agricultural Report of the County of Northumberland.

† Corrected Agricultural Report of the County of Suffolk. ‡ Ibid.

beneficial in its effects than that by means of the horſe-hoe or plough. In the former mode the expence of the two hand-hoeings are generally from ſix to eight or nine ſhillings the acre; while in the latter it rarely amounts to more than four or five. Beſides, by the uſe of the horſe-hoe or plough in the intervals, the crops are not only kept more clean, but a more continued and more abundant ſupply of nouriſhment provided for the growth of the plants, on account of the repeated full aeration of the mold that muſt take place.

In performing the turnip culture in this way, many different implements have been recommended by different cultivators; but it would ſeem that the operation may be accompliſhed with ſufficient exactneſs by any ſmall light plough. In many diſtricts, the hoe-plough is employed in this buſineſs with ſucceſs. The Northumberland farmers chiefly make uſe of a ſmall light plough, about five inches in width at the bottom behind and eleven at the top, which is drawn by a ſingle horſe, for the purpoſe of ploughing the intervals between the rows, which is found to anſwer extremely well: but doctor Anderſon contends that the work may be performed in the moſt perfect manner by the common light ſwing-plough. In earthing up the rows, the double-mold-boarded plough may, however, be probably more expeditious and convenient. Improved double ploughs of this ſort have been contrived for the purpoſe of cleaning turnip crops, and are ſaid to be employed with conſiderable ſucceſs and advantage; as by their capability of being readily ſet to different diſtances, ſo as to ſuit the different widths of the rows, they not only perform the buſineſs of removing or paring off the earth from both ſides of the rows at the ſame time, but by being brought cloſe together effect the operation of earthing up the plants. In conducting the proceſs with this implement, there is obviouſly not only an advantage in double the quantity of work being performed, but the operations are accompliſhed with more correctneſs, both in reſpect to the ſtirring of the earth in the intervals of the drills and the application of the mold to the ſtems of the young plants *.

Others, however, contend that theſe advantages may be equally attained by performing the buſineſs in a particular method by means of a ſingle-mold-boarded paring-plough, drawn by one horſe, while the danger and inconvenience of being obſtructed by ſtones or other matters is leſſened or wholly removed. This is that of paring only one ſide of the ridge at a time, leaving the other to be performed ſome days afterwards. After the turnip plants have

* Farmer's Magazine, vol. I. p. 413.

been properly ſet out, the work is ſaid to be begun and conducted in this manner: the ridges of the field lying in the direction of eaſt and weſt, the operation is begun from the eaſt end of them and the north ſide of the field; the ploughman counting off to his right hand, on that ſide, a certain number of ridges, as for inſtance ſix, enters upon the ſeventh, and, proceeding weſt, pares a furrow-ſlice from the north ſide of it, and turning to the left, in returning does the ſame to the ſouth ſide of it *. Continuing in this way to go weſt, the ſame operation is performed on the north ſides of each of the ſix ridges that lie to the north of that from which he ſet out; and in returning eaſt, on the ſouth ſides of the ſame number of ridges which lie to the ſouth of it. After having completed in this manner one *pitch* of work, conſiſting of thirteen ridges, he is to begin again in a ſimilar manner, and proceed in the ſame way till the whole of the field is gone over. After the weeds turned in by this firſt operation are ſuppoſed to be perfectly decayed, the ſame work is performed in the contrary direction on the other ſides of the ridges, or thoſe left in the other operation, over the whole field †. This method of hoeing or cleaning turnip crops, which appears to have been practiſed with much ſucceſs on a light ſandy ſoil, free from ſtones, by Mr. James M'Dougal, a farmer at Linton in Scotland, is, it is obſerved, carried on as long as the ſtems of the turnip plants will admit the plough to paſs. In this mode the plants are never earthed or ſet up, it being the opinion of the above cultivator that they thrive better without that operation. And, beſides that, in feeding them off with ſheep, they get better at them, and have a more eaſy footing, as well as more comfortable lying.

In accompliſhing theſe operations, it is obſerved that great care is neceſſary to keep the plough as near as poſſible to the plants on the ridges, as by that means different advantages are attained, ſuch as the greateſt poſſible proportion of weeds being removed from the plants ſtanding on the pared ridges; the largeneſs of the furrow ſlices thus raiſed being ſufficient to cover up all the weeds that grow in the intervals, between the drills of turnips on the pared ridges and thoſe upon which the furrow ſlices are turned. Beſides, the moiſture may be better preſerved in droughty ſeaſons for the growth of the crop, and the ſoil more perfectly aerated, in conſequence of being more frequently ſtirred. It is obvious alſo, from one ſide of the ridge only being pared at a time, and the

* This ridge is ſometimes provincially denominated the *ſairing ridge*.

† Farmer's Magazine, vol. II. p. 50.

other left firm and unpared, that the plough may be capable of being brought nearer to the turnips without the riſk of looſening them too much, or turning over the earth on which they ſtand, than could be the caſe if both ſides were pared at the ſame operation *.

In whatever way the operation may be performed, or whatever plough or hoe may be made uſe of, it muſt be of the greateſt advantage to have the mold well looſened near to the plants, eſpecially on the heavier deſcriptions of turnip ſoils; and in theſe, as well as thoſe of the more light kinds, the turnip plants ſhould never be ſuffered to be annoyed or incumbered by any ſort of weeds growing near them.

Turnip crops are expoſed to danger from different cauſes during the early ſtages of the growth of the plants; but the chief are the attacks of the fly †, the ſlug, and the black caterpillar. The firſt chiefly prey upon the tender ſaccharine ſeed-leaves of the young plants, and its preſence is rendered ſufficiently evident by its leaving many little brown ſpots on them, and by eating away their fleſhy green parts down to the fibres. They are ſaid to increaſe both in number and ſize until the plants are conſumed. The ravages of the ſlug may be eaſily traced, by obſerving the edges of the leaves; as it is upon them it firſt begins to feed, gradually proceeding from one part to another till each of them is more or leſs conſumed, and the whole of the plants in many caſes deſtroyed. It has been well remarked, that a field of young turnips, when attacked in this way, exhibits ſome of the leaves as having loſt a quarter, others one-half, ſome three-fourths, and others the whole, the ſtems only remaining ‡; and in ſome inſtances theſe are alſo attacked.

The depredations of the black caterpillar principally take place after the crops are in a more advanced ſtate of growth, and the plants have formed conſiderable tops, and are in what is uſually termed *rough leaf*; the green parts of the leaves being eaten through and deſtroyed, and of courſe the growth of the plants prevented.

Various means of preventing the young turnip plants from being deſtroyed by animals of theſe kinds have been ſuggeſted at different times; but hitherto

* Farmer's Magazine, vol. II. p. 56.

† This highly miſchievous inſect, according to Linnæus, belongs to the *Genus Coleoptera*, and is deſcribed under the titles of *Cryſomela oleracea* and *Cryſomela nemorum*; the former being of a dark-blue colour tinged with green, and the latter black ſtriped with yellow on the different ſhells, and ſomething larger than the other.

‡ Corrected Agricultural Report of Middleſex, p. 210.

probably without any of them being fully effectual. It would ſeem, however, from what has been already advanced, that their ſafety and preſervation depends much both on the land being ſo enriched by manure, and in ſuch a condition in reſpect to moiſture, as that the germination of the ſeed and after-growth of the plants may be ſuch as to render them quickly in the ſtate of *rough leaf*. This, as has been ſeen, may likewiſe be further promoted, eſpecially in hot and dry ſeaſons, by ſteeping the ſeed in ſome watery or other liquid before depoſiting it in the ſoil. In theſe as well as other views it has been recommended to make uſe of new ſeed and ſuch as is one year old together, as in this way the crops, by coming up at different times, may be leſs in danger of being wholly deſtroyed; or, what is probably a better practice, to ſteep one-half the ſeed, after being thus mixed, in water for twenty-four hours, and then blend the other half with it, ſowing the whole in the uſual manner. In this management the plants, by riſing at many different periods, may have a greater chance of eſcaping in ſufficient quantity for the purpoſe of a crop *. This method is indeed particularly inforced by the obſervation, that the inſects frequently make their attacks ſuddenly in large numbers, deſtroying the plants as faſt as they riſe, and as ſuddenly diſappear, leaving ſuch as come up a few days afterwards untouched. The ſucceſs that has attended the ſteeping of turnip ſeed in the juices of different kinds of vegetables, and alſo in train-oil, linſeed-oil, or other oleaceous liquids, as has been adviſed by different cultivators, ſeems to depend on the ſame principle, and affords an additional proof of the advantages that may be derived in this way †. Where ſuch oily ſubſtances are employed, it is uſual to let the ſeed remain in them twenty-four hours or more; and, after it has been taken out, to drain them well from it by means of a fine ſieve, linen bag, or other contrivance; then mix with it finely-ſifted earth or ſand, depoſiting it in the ſoil as quickly afterwards as poſſible. In this method the ſame oil may ſerve different times.

On the ſuppoſition that ſome other ſorts of plants are more agreeable, and conſequently more ſubject to be fed upon by this devouring inſect than the turnip, the practice of ſowing other ſorts of ſeed with that of the turnip has been lately revived and recommended ‡. In this intention it has been adviſed to mix and ſow radiſh ſeed with that of the turnip, in the proportion of about

* Modern Agriculture, vol. II.

† Annals of Agriculture, vol. VI. pp. 90, 156, and vol. IX. p. 389; and Tranſactions of the Society of Arts, vol. V. p. 38.

‡ Tranſactions of the Society of Arts, &c. and Commercial and Agricultural Magazine, vol. VII.

two pounds to the acre. It is evident, however, that this plan muſt be extremely uncertain, as it cannot be ſucceſsful except where the two kinds of plants riſe exactly at the ſame time, which, from the great difference in the vegetative powers of the two ſeeds, will probably ſeldom be the caſe. If any advantage is to be gained in this way, it muſt be by employing a plant which is preferred to that of the turnip, and the ſeed of which is ſomewhat quicker in its germination and growth; as, where this is not the caſe, the turnips may frequently be deſtroyed before the other plants be in a ſtate to be fed upon *. It has been ſuggeſted that the *tuta baga*, or Swediſh turnip, may be a more uſeful ſubſtitute in this view than the radiſh; as, by its being ſteeped and the turnip ſeed ſown dry, the plants would riſe well together, and the fly is well known to be ſo eager in feeding upon it, that it is with difficulty the cultivator can preſerve a ſufficient plant. In this caſe it is hinted as a further advantage, that when both ſorts of plants remain without ſuſtaining any material injury, the farmer may have the option of cutting out either of them, as he may find the moſt convenient and beneficial †.

* Commercial and Agricultural Magazine, vol. VII. p. 90.

† It is doubtful whether the radiſh plants are always preferred by this inſect or not; as we have often remarked in the garden, that where turnip and radiſh crops were cultivated adjoining each other, the leaves of the former were equally devoured with thoſe of the latter. Mr. Marſhall, in the ſecond volume of the Rural Economy of the Midland Counties, after remarking that the inſect is not a *fly*, but a *beetle* of the latter of the kinds deſcribed above, gives the following very accurate deſcription of it: The whole length of the body and head is, ſays he, from one-twelfth to one-tenth of an inch, and its width or breadth about half its length. The *antennæ* conſiſt of two points, and are about two-thirds of the length of the body. The wing-caſes are concave, and join by two ſtraight edges, having the colour of dark chocolate, with a ſtripe of yellow white along the middle; occupying about one-third of the ſurface, which is dimpled, poliſhed, and ſhell-like, both ſides the ſame, the texture being brittle as egg-ſhell. The wings are folded back under the caſes, being membranous and nearly twice their length, having two or three ſtrong nerves running about half their length. Their colour a light brown or that of ſtone, but that of the nerves a dark brown. The legs ſix, and black; the two hind ones clubbed upwards. The head and breaſt black and poliſhed. The abdomen the ſame, having four articulations.

In taking this inſect for the purpoſe of examination, the author diſcovered that he had bruiſed a number of ſoft inſects on the under-ſides of the ſeedling leaves, which led him to examine them more carefully, and to find that they were *paved* over with minute animals of the *appis* kind, having different colours, as yellow, green, black, and two or three long-winged flies. On ſtill more minutely examining them, he found that both the animalcules and the flies were individuals of the ſame inſect in different ſtates.

He gives the following deſcription of the flies:—The body and head are black, ſhort, nearly egg-ſhaped, and about one-twentieth of an inch long, being ſomewhat larger than a grain of muſtard-

Remedies of this nature are probably, however, much leſs to be depended upon than thoſe that have been mentioned above.

As the effects of the ſlug, which is an animal of the white ſnail kind, on turnip crops, are often equally, if not more, deſtructive than thoſe of the fly, from its attacking them at a later period, and conſuming not only the leaves, but the more ſolid parts of the plants, it is neceſſary for the cultivator to guard againſt them alſo as much as poſſible. In this intention various means have been propoſed, but probably without any of them being completely ſucceſsful: from its having been remarked, that theſe ſlugs chiefly quit terreſtrial habitations during the night-time, or early in the morning before the ſun riſes, when the ſurface of the ſoil is moiſt from the dews, it has been adviſed, by the older as well as the more modern writers on agriculture, to have recourſe to rolling in the night with a roller of conſiderable weight, in order to cruſh and deſtroy them before the light or heat of the day induces them to retire into the ſoil *. The ſecond of theſe writers ſeems indeed to believe that the practice may be uſeful againſt the fly, where theſe inſects exiſt in great numbers, and the operation is performed while the ſurface is wet, by licking them up with the clammy earth, and in that way wholly removing them. It may alſo be beneficial againſt ſuch inſects, by confining the moiſture more effectually in the ſoil, or by preventing the germs of the young turnip plants from appearing before their roots are fully eſtabliſhed in the earth.

The diſperſing of different ſubſtances, ſuch as vegetable aſhes, lime, and ſoot,

feed. The wings four: two very long, ſtanding high above the tail, more than twice the length of the body; two very ſhort, not ſo long as the body; but both pairs tranſparent, and ſtrengthened by a few opake ſtraight nerves. The *ſhade* coppery and elegant. The *antennæ* long, ſlender, and tapering, but the joints indiſtinct; the former about three-fourths of that of the body. The colour black. The legs ſix, but of a lighter colour than the body. The proboſcis large, long, cylindric, and jointed, ending in a *point*, which the inſect in either ſtate inſerts into the leaf. When the animal couches at feed, this appears to iſſue from the abdomen; but on being raiſed upon the legs, it evidently paſſes to the ſnout. In walking it is carried under the belly, lying cloſe to the thorax, and reaching about half the length of the body. The abdomen nearly globular; flatted at the apex; with a minute black club ſtanding out on either ſide, as in the fly and louſe.

From theſe inſects having been obſerved to be extremely numerous on the ſeedling leaves of turnip plants, not *eating*, but, as it were, *ſucking* their juice or ſap through long proboſces, that ſerve to attach them to the leaves in the manner of leeches, the intelligent author is led to conclude that they may be the cauſe of the very ſlow progreſs that is ſometimes made by the young turnip plants to puſh into *rough leaf*.

* Ellis's Agriculture Improved, vol. II.; Reynolds in Tranſactions of the Society of Arts; Mills's Practical Treatiſe on Huſbandry; and Vagg's Letter.

in the ſtate of fine powder, over the turnip crops by the hand, may likewiſe be occaſionally employed with advantage both againſt the fly and ſlug, in the proportion of about ten or fifteen buſhels of the firſt, and twenty of the others: the former by the powers which they poſſeſs of deſtroying ſuch animals, their attracting humidity from the atmoſphere, and their furniſhing more abundant ſupplies of nouriſhment to the young plants; the laſt by its rendering the young plants naufeous and unfit to be fed upon, as well as the promoting of the more rapid growth of the plants. The ſprinkling of water in which tobacco-leaves have been infuſed over the plants, from the tail of a cart, has alſo been ſuggeſted as uſeful on the ſame principle as ſoot againſt the ſlug*; or, what is probably better, eſpecially where the crop is not extenſive, as being found highly ſucceſsful in garden practice, the mixing of the tobacco-water with ſoap-ſuds and urine. The uſe of this compoſition is ſaid not only to bring them up from their holes and habitations, by which they quickly die, but deſtroy the ova depoſited in the ſoil †.

There are ſtill other methods recommended for the purpoſe of preventing the depredations of this animal, one of which ſeems equally cheap, convenient, and effectual; which is, that of ſowing barley chaff over the whole of the crop immediately on its firſt appearance, as by this means the ſlugs become directly entangled and deſtroyed. In the way of a palliative, it has likewiſe been ſometimes a practice to turn a flock of ſheep upon the turnip lands, keeping them conſtantly in motion by means of a dog and perſon to attend them ‡. In this mode the ſlugs are ſhaken from the young plants, and deſtroyed by being trodden into the ground.

Againſt the ravages of the black caterpillar, which, as has been obſerved, take place in the more advanced growth of the turnip plant, the uſe of the tobacco infuſion or mixture juſt mentioned may frequently be ſerviceable, and even the application of the barley chaff over the crop on the caterpillars firſt ſhewing themſelves, taking care at the ſame time to paſs a light buſh-harrow over it in order to diſplace the animals from the plants to the ground. It has alſo been hinted, that the fly, from which this ſort of caterpillar is produced, might be prevented from fixing upon the plants, by cauſing any thick offenſive ſmoke to paſs over the field, provided the period of its coming could be exactly

* Corrected Agricultural Report of Middleſex, p. 210.

† Forſyth on Fruit Trees, 8vo. edition, p. 395.

‡ Corrected Agricultural Report of Middleſex, p. 210.

known, and the ſtate of the wind be at the ſame time favourable *. From the great uncertainty of theſe circumſtances, the practice can probably ſeldom be had recourſe to with ſucceſs. Indeed, though an able and intelligent writer has preſented us with much valuable information concerning this deſtructive caterpillar †, we are probably ſtill too imperfectly acquainted with its natural hiſtory, economy, and habits of life, to direct the moſt ſpeedy and effectual method of deſtroying it.

Beſides the diſeaſes ariſing from theſe cauſes, and which affect the leaves of the plants, the turnip is ſubject to a diſeaſe in its root. This is a large excreſcence forming itſelf below the apple or bulb, which, after becoming in a ſtate of maturity, takes on the putrid fermentation, and ſends forth a moſt offenſive ſmell. It has obtained the title of *anbury*. In ſeveral ſpecimens examined by Mr. Marſhall, the apples of the turnips were found juſt forming, as about the ſize of walnuts in the ſhell, while the anburies were as large as the egg of a gooſe, being awkward and irregular in their form, with inferior excreſcences, ſomewhat reſembling races of ginger, depending from them. On being cut, their general aſpect was that of a hard turnip; but on being examined with more minuteneſs by means of a magnifier, veins or ſtring-like veſſels were obſerved diſperſed through the pulp: the ſmell and taſte being in ſome reſpect ſimilar to that of the common turnip, but without its mildneſs, having an auſtere diſagreeable flavour, approaching to that of an old ſtringy turnip. The tops in ſuch as were much affected turned yellow and flagged by the heat of the ſun, being eaſily diſtinguiſhable in the day-time from the healthy plants. This diſeaſe has often been aſcribed by farmers to the land being too long continued under this ſort of crop; but the experience of the author ſtrongly oppoſes it, as he found the diſeaſe in turnips taken from land that had probably never borne that ſort of crop before. The cauſe has, perhaps, not yet been fully inveſtigated; but Mr. Marſhall ſeems to ſuſpect it to proceed from the wound or puncture of ſome ſort of grub in the veſſels of the tap-root, by which the courſe of the ſap is diverted, and, inſtead of the natural apple or bulb being formed, this excreſcence takes place. This is further confirmed by the circumſtance of the diſeaſe being much connected with the dryneſs of the ſeaſon. The only remedy that can be of much utility in caſes of this kind, is probably that of removing the diſeaſed plants as ſoon as poſſible, and ſtirring

* Corrected Agricultural Report of Middleſex.

† Marſhall's Rural Economy of Norfolk, vol. II.

the earth about thoſe that remain, in order to ſupply them more abundantly with nouriſhment. But in order to wholly avoid the diſeaſe in thoſe diſtricts where it is apt to occur, turnips ſhould only be ſown on ſuch lands as have been fully prepared and well enriched by manure.

On light thin ſoils, in dry ſeaſons, the mildew is alſo a diſeaſe that is ſometimes apt to affect turnip crops, and do great injury to the young plants by reſtricting their growth. The only remedy in this caſe is probably that of properly thinning the plants, and ſtirring the earth well about their roots occaſionally, by means of the hoe, in order to provide them more fully with nouriſhment. Where it occurs in lands of a more retentive quality, advantage may likewiſe, perhaps, be obtained, by rendering them drier by deepening the ridge-furrows, or ſome other ſimilar method.

It occaſionally happens that turnip plants, inſtead of ſwelling and forming bulbs, ſend off numerous ſtringy roots, which ſoon decay and come to no account *. It occurs moſt generally where the crop is ſown on freſh land, and no remedy is ſaid yet to have been diſcovered to prevent it †. More perfect tillage and the uſe of ſuch manures as have a tendency to render ſuch lands more mellow and friable, may perhaps be beneficial.

It is frequently a practice in many places where turnip crops have been eaten off by the fly, or deſtroyed in any of the ways that have been mentioned, to ſow the ſame land over again, and harrow the ſeed in, without having recourſe to the plough: this, however, is a method that ſhould ſeldom or ever be adopted, as in ſuch a mode of proceeding there muſt conſtantly be great danger of the plants of the ſecond ſowing being deſtroyed in a ſimilar manner. It is perhaps always a better practice either to give the land a ſhallow ploughing, by means of a light plough, before ſuch ſecond ſowing is performed, or to leave it entirely for a crop of wheat ‡.

The ſeaſons moſt ſuitable for turnip crops are thoſe in which the weather is warm, with frequent ſhowers, but little continued rain. In the autumn and winter periods, when frequent changes from froſts to thaws and rain take place, turnips commonly experience great injury, being rendered extremely ſubject to decay, and become rotten; and even ſuch as withſtand ſuch ſeaſons ſeldom afford a due proportion of nouriſhment to the ſtock that may be fed upon them.

* This ſtate of the turnip plant is often provincially diſtinguiſhed by the terms *fingers and toes.*

† Corrected Agricultural Report of Lincolnſhire, p. 136.

‡ Synopſis of Huſbandry, p. 146.

Rooks, if not prevented, often do conſiderable miſchief to turnip crops in the winter time, by picking holes in the bulbs, admitting the wet, and thereby cauſing them to decay *.

The produce of turnip crops varies greatly according to the ſeaſon, the nature of the ſoil, and the method of cultivation that is practiſed: but a medium crop, where the ſoil is good and ſuitable for the purpoſe, may afford fifteen tons, or ſomething more, on the acre; in many inſtances it will, however, be much leſs. The value of theſe crops will depend upon various circumſtances: as their quality and abundance; the manner in which they are conſumed, as on the land or in cribs or ſtalls; in fattening or rearing different ſorts of live ſtock; and the ſtate of the markets in reſpect to the ſale of ſuch ſtock. In general it may be from about three to ſix or ſeven pounds the acre. It is found by experience that an acre of good turnips will be ſufficient to fatten a beaſt of about forty ſtone, or eight ſheep †. In feeding off in the open field, they are found to pay from two ſhillings and ſix pence to four ſhillings and ſix pence the ton, a crop of twenty tons producing in beef or mutton from fifty ſhillings to four pounds ten ſhillings, beſides the dung and urine, which may be equal to fifty ſhillings more. When conſumed by cattle in ſtalls, they are ſtated, however, to afford one ſhilling a ton more than when eaten by them in the field ‡.

In cultivating turnips for ſeed ſome attention is neceſſary, as, where it is collected from ſuch turnips as have been ſown three or four years in ſucceſſion, the roots are apt to be numerous and long, and the necks or parts between the bulbs and leaves coarſe and thick: and when taken from ſuch as have been tranſplanted every year, theſe parts are liable to become too fine, and the tap-roots to be diminiſhed in too great a proportion ‖.

The moſt certain method is to procure ſeed from turnips that are tranſplanted one year and ſown the next; or, if they be tranſplanted once in three years, it is ſuppoſed by ſome that the ſtock may be preſerved in a proper ſtate §. The method of performing this buſineſs is to ſelect ſuch turnips as are of the beſt kinds and of the moſt perfect forms, from the field crops, and, after cutting their tops off, to tranſplant them, about the month of November or December, into a piece of ground that has been put into a fine ſtate of preparation by repeated ploughing or digging over, and which ſhould be ſituated as near the houſe as

* Synopſis of Huſbandry, p. 148.

† Donaldſon's Modern Agriculture, vol. II. p. 318.

‡ Corrected Agricultural Report of Middleſex, p. 208.

‖ Kent's Hints. § Ibid. and Experienced Farmer, vol. I. p. 56.

poſſible, in order that the birds may be better kept from it. The ſeed will, in general, be ready for gathering in the July or Auguſt following *.

Some, however, recommend that the ſeed collected from a few turnips thus tranſplanted, ſhould be preſerved and ſown in drills, in order to raiſe plants for ſeed for the general crop, drawing out all ſuch as are weak and improper, leaving only thoſe that are ſtrong and which take the lead; and that when theſe have appled or formed bulbs, to again take out ſuch as do not appear good and perfect, as by this means turnip ſeed may be procured, not only of a more vigorous nature, but which is capable of vegetating with leſs moiſture, and which produces ſtronger and more hardy plants. The practice of tranſplanting the whole of the turnips for ſeed for the main crops being contended to be not only highly expenſive but injurious, by diminiſhing the ſtrength of the plants from the deſtruction of their tap-roots †. Good ſeed may, however, be raiſed in either of the methods.

When the ſeed is become fully ripened, which is moſtly about the times juſt mentioned, it is in ſome diſtricts reaped by cutting part of the ſtems, and afterwards tying them up into ſheaves, which, when ſufficiently dry, are built into long ſtacks, and kept through the winter, in order to be threſhed out about the periods when it is wanted, as in April or May ‡. But as in this way much ſeed is liable to be loſt, by its readineſs to eſcape from the pods or ſheaths in which it is contained, it is perhaps a much better practice to have it immediately thraſhed out either upon a cloth on the ſpot where it grew, or in ſome convenient place at home. It ſhould then be put into proper bags or veſſels, and placed in a perfectly dry ſituation.

As crops of this ſort are ſubject to much injury and loſs in various ways, the quantity of produce muſt be variable; but it may in general be eſtimated at not leſs than from twenty to twenty-four buſhels the ſtatute acre. The price of turnip ſeed being ſeldom leſs than ſeven or eight ſhillings the buſhel on account of the great demand for it, this ſort of culture may at firſt ſight appear highly advantageous; but if the exhauſting nature of the crop, the loſs ſuſtained in that of a grain one, and the quantity of manure that muſt afterwards be applied, be conſidered, it is probably only in particular ſituations of ſoil and climate that turnip ſeed can be grown to much advantage.

* Corrected Agricultural Report of Northumberland.

† Experienced Farmer, vol. I. p. 56.

‡ Corrected Agricultural Report of Northumberland.

In the application of turnips to the purpoſes of feeding and fattening different ſorts of live ſtock, there is much variety in the practices of different diſtricts; but the moſt economical and advantageous modes of conſuming this highly uſeful root under different circumſtances of ſoil, climate, ſituation, and animals, have probably not yet been ſufficiently inveſtigated or aſcertained by cultivators.

Though few experiments appear to have been inſtituted with a view of determining the particular ſtate in which theſe roots afford the greateſt proportion of nouriſhment to the animals that feed upon them; it would ſeem, from their containing a much larger proportion of nutritious ſaccharine juicy matter while in their freſh or green ſtate before being taken from the ground, than when taken from the land and preſerved by being packed up in ſheds or other places *, to be a more economical and beneficial practice, eſpecially where the nature and ſituation of the ground and the ſtate of the ſeaſon will admit of it, as on the dry ſoils in moſt of the ſouthern diſtricts, to conſume them under the former than the latter circumſtances; but in the more cold expoſed ſituations, as in many diſtricts in the northern parts of the kingdom, and wherever the lands are much inclined to moiſture, as the roots may be greatly injured by the froſts, and the animals receive much injury from the coldneſs of ſuch places, while feeding on them, as well as the lands be much damaged by their treading, it may be better to eat them under the latter. There are likewiſe other ſituations in which it may be particularly neceſſary, as well as advantageous, to make uſe of turnips after being drawn and removed from the land to places of ſecurity; as thoſe where it is difficult or inconvenient to raiſe other ſorts of green cattle food for winter and ſpring uſe. But wherever crops of this kind are taken from the ground to be conſumed by animals in other places, as from their large growth and luxuriant nature they muſt tend greatly to exhauſt and draw away its fertility †, it will conſtantly be neceſſary to return an equivalent in manure, otherwiſe the injury ſuſtained in this way may more than equal the advantages of the turnip crops. The tap-roots of the turnips ſhould, likewiſe, be broken off and left on the land, that neither ſoil nor manure may be carried away by adhering to them ‡.

* This is evident from their loſing their firmneſs, and becoming ſoft, wrinkled, and flabby, and diminiſhing conſiderably in weight.

† Corrected Agricultural Report of the North Riding of Yorkſhire, p. 148.

‡ Corrected Agricultural Report of Middleſex.

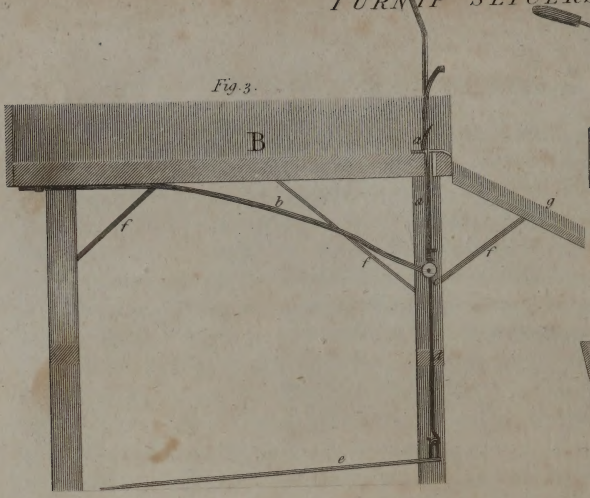
Where the lands are ſufficiently dry, in a high ſtate of fertility, and conducted under a judicious ſyſtem of huſbandry, it may often, however, be an advantageous and economical practice to have a partial recourſe to both the methods; by having one part of the crop drawn and removed to be eaten in ſome convenient ſituation off the land, according to the particular circumſtances of the caſe, and the other conſumed in the field where they grow: as by ſuch means a much larger quantity of ground may be benefited and improved, without injury being done to the crops that may be afterwards cultivated on the land *. This method of rendering arable grounds proper for the growth of turnip crops ſeems to have been too much neglected, conſidering the great advantages that may be derived from it in the feeding and rearing of live ſtock, as well as in the amelioration of the land †.

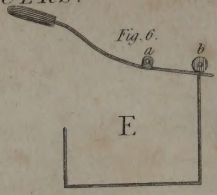
The nature of the animals by which turnip crops are conſumed muſt obviouſly introduce differences in the manner of their application. When they are employed in the rearing or fattening of neat cattle, they are generally pulled up and eaten either after being conveyed to ſome convenient dry piece of ground in the ſtate of graſs or ſtubble, or ſome place of ſecurity contiguous to the ſtraw-yards or feeding-houſes; in the latter methods, the turnips being given to the animals in bins or cribs, or placed before them in ſtalls conſtructed for the purpoſe, in which the cattle are tied up. The laſt is probably the better practice, though not ſo frequently employed; as there is the leaſt poſſible waſte, at the ſame time that the dung and urine of the animals are the moſt effectually preſerved. In the firſt method the fat ſtock are firſt admitted, the lean following to eat up what may remain: they are often conſtantly confined upon the turnips, except when prevented by the ſeverity of the ſeaſon, in which caſe the ſtraw-yard is generally made the place of their conſumption. The lands to which alſo turnips are removed in this way of feeding, are, in ſome diſtricts, thoſe in-

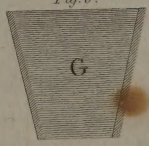
* Kent's Hints, p. 116.

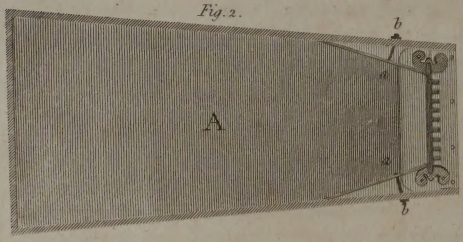
† Ibid. It is obſerved by the ſame writer, that where the crops are good "twenty acres will at leaſt fatten fifteen bullocks, and ſupport ten followers, or ſtore cattle, for twenty-five weeks; or ſheep in the proportion of eight to one bullock;" beſides the advantages in preparing the land for other ſucceeding crops, which he conſiders as far greater than the other "in point of real profit." For he thinks it evident, that moſt of the eſtates in the county of Norfolk have been improved in the proportion of at leaſt forty *per cent.* ſolely by marling and adopting this mode of raiſing turnips; as many thouſand acres now produce fine crops of grain and turnips, and ſupport a prodigious number of ſheep and other ſorts of ſtock, which were formerly covered with various kinds of coarſe plants and unproductive.

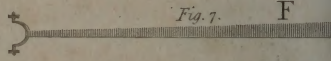
TURNIP SLICERS.











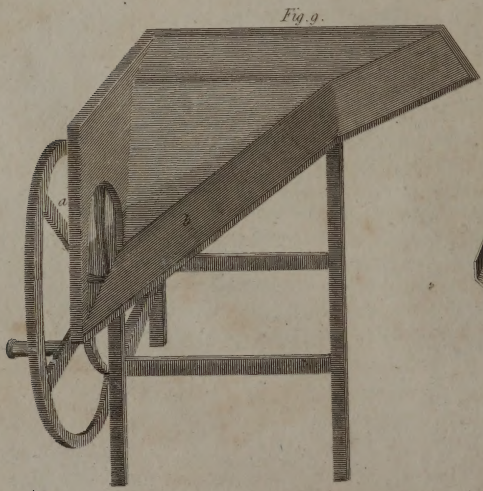


PLATE IV.

Turnip Slicers.

[*To face Page* 671, *Vol. II.*]

Fig. 1. REPRESENTS an improved *Turnip Slicer*, invented by Mr. Martin of Clifton, Nottinghamſhire.

A. *Fig.* 2. Plan of the trough, ſhowing the iron plate, &c. to receive the cutting-knives with the conductors, *a a*, made of plate-iron faſtened with bolts, nut, and ſcrew, *b b*.

B. *Fig.* 3. A ſection of the machine, ſhowing the cutting-knives, &c. *a a*, edgeways, which are ſuppoſed to be drawn down: *b*, the ſpring with braſs wheels at the end: *c* is for the purpoſe of raiſing the knives with more eaſe, and is kept in its place by two ſmall pieces of iron plate faſtened to the bottom of the knife-frame, ſo as to allow for the different lengths of the ſpring according to its ſituation: *d*, an iron rod hooked into a ſwivel in the knife-frame, and extending to the treadle *e*. N. B. The treadle may only be uſed occaſionally, when the handle is not found ſufficient: *fff*, iron braces for ſteadying the legs and ſupporting the ſpout *g*.

C. *Fig.* 4. Shows the frame through which the knives with their frame ſlide, grooves being made in the ſides, *a a*, to receive the ſame. The circular part at top, marked *c*, is bent back (as may be ſeen) in the ſection B, to make room for the nut and ſcrew which faſten the handle to the knife-frame. This frame is faſtened to the bottom, *d d*, by cheeks, as may be ſeen in the plan A. In the ſection of the bottom, *d d*, are ſhown the holes through which the ſmall knives paſs.

D. *Fig.* 5. The cutting-knives and frame: *a*, the great knife which, when in action, ſinks into the long groove up to the ſhoulders, *b b*: *c c c*, the ſmall knives which are fixed at right angles with the large one, the tops of which are riveted into the large knife; the lower ends of the ſame are kept at equal diſtances, by being let through a ſmall bar and faſtened with a nut, a worm being made at the end of the knives. The frame which carries theſe knives is faſtened only to the great knife, *b b*: *d*, a hole in the frame to faſten the handle to. The ſides, *e e*, have a worm at the bottom, by which the bar *f* is faſtened to the ſame with nuts: *g* the ſwivel for the treadle bar: *h h* the guides for the braſs wheels to the ſpring. It will appear that the great knife being faſtened to the frame, the ſmall knives will neceſſarily project before the ſame.

E. *Fig.* 6. The handle and guide to the ſame: at *a* the handle is fixed with a ſcrew-bolt and nut to the knife-frame, ſo as to move eaſily: *b*, a braſs wheel fixed in an iron ſtrap ſcrewed to the machine, ſo contrived that the end of the handle will paſs through an opening below the wheel, the uſe of which is to act as a reſt to the extremity of the handle, and to prevent friction, its ſituation varying conſiderably with the motion of the knife-frame.

F. *Fig.* 7. Plan of the iron ſpring which raiſes the knives, made two inches wide at one end and about one at the other, and a quarter of an inch thick, faſtened at the end with a nut and ſcrew to the bottom of the trough with a ſtrap near the end.

G. *Fig.* 8. Plan of the ſpout.

The turnips, when ſmall, are put to the knives by a piece of board, the length of the knives, about four inches broad, with a handle at the back. Great turnips may be put to the knives without this inſtrument, but in ſmall ones there is danger of cutting the fingers. The machine will cut turnips into pieces $\frac{1}{2}$ inch by $\frac{3}{4}$ ſquare; and, of courſe, (if the turnip be large enough) $4\frac{1}{2}$ long.

Fig. 9. Repreſents a *Turnip Slicer* upon a different principle: The turnips in this machine are cut by means of a knife fixed on the fly wheel *a*, being brought to it through the inclined trough or box *b*.

tended to be ploughed up the enſuing year for wheat or other ſorts of grain; conſequently each field, in its turn, has the advantage of having ſuch crops conſumed upon it, which is found more beneficial than feeding them on the land where they grow *. The turnips in theſe caſes ſhould not be ſcattered over the ground in too thick a manner; as, where that is the practice, much loſs muſt be ſuſtained by their being cruſhed and bruiſed by the feet of the animals. All theſe different practices are met with in the county of Norfolk, where great numbers of different breeds of cattle are annually fattened upon turnips.

In moſt of the turnip diſtricts in the northern parts of the iſland, when converted to the purpoſe of rearing young ſtock, they are generally conſumed in the ſtraw-yards, when the farmers have the advantage of ſuch conveniences; but in other caſes, in the ſame manner as above.

Near large towns, where milk is a principal object, turnips may likewiſe often be applied in the way of a rich ſucculent food for milch cows; but in this mode of uſing them great care ſhould be taken that all the putrid and decayed leaves or other parts of the turnips be removed, otherwiſe the milk may be liable to derive an unpleaſant flavour from them †. The offal produced by theſe means may be made uſe of for the dry ſtock, and of courſe little or no loſs be ſuſtained.

Turnips have alſo been found to be capable of being applied in the feeding of labouring horſes with much ſucceſs; as by their uſe the uſual quantity of corn may be leſſened in the proportion of nearly one-half, and the animals not only improve in condition, but perform their buſineſs with greater eaſe and be leſs ſubject to complaints of the bowels than when fed in the ordinary way ‡. Where employed in large proportions in this mode of application, as they are extremely ſucculent, it may be advantageous to have them prepared by means of fire, as by ſteaming; but in other caſes, where they are uſed in only a ſmall quantity, they may be given raw, after being ſliced or cut into ſmall pieces by a machine conſtructed for the purpoſe, a proper proportion of dry food being given at the ſame time.

In the conſuming of turnips by ſheep, which, where the moſt valuable breeds

* Corrected Agricultural Report of Northumberland.

† Corrected Agricultural Report of the County of Perth, p. 184. It is obſerved in the ſame work, that where ſuch a taſte prevails, it may be completely removed by making uſe of a very weak ſolution of nitre in water.

‡ Farmer's Magazine, vol. II. p. 249.

are introduced, is the moſt extenſive application of ſuch crops, the moſt general practice, where the lands are light and ſufficiently dry, is that of confining them upon a ſuitable proportion of the crop, by means of nets or hurdles, removing them to freſh portions or *breaks* every eight or ten days, or oftener, according to circumſtances; but if the grounds be of the more heavy kind and ſomewhat retentive of moiſture, it is a better and more economical method to have the turnips conveyed off the land to ſome neighbouring field, as has been already noticed, as by this mode there is not only leſs injury and waſte by the treading of the turnips into the ground, but the ſheep get a more regular ſupply of freſh food, and the ſhells, by being left clean, are more completely eaten up by the ſtore cattle that are to follow *.

Where the cuſtom of eating on the ground is employed, it is alſo ſometimes, as when the land is poor, a practice to draw every other ridge of turnips, and remove them from the field to be eaten in another place, while the remainder is conſumed upon the land on which they grew †.

In folding upon turnips it is moſtly the cuſtom to turn the ſheep upon them while ſtanding in the field; but, except where the bulbs are much expoſed above the ſurface of the land, it is probably a much better practice to have them drawn up before the hurdles are fixed or the ſheep turned in, as the animals are not only leſs apt to break and ſoil the turnips, but feed much better upon them. This is a method of proceeding not unfrequently had recourſe to in the county of Norfolk ‡.

Whatever method may be adopted in fixing the hurdles, attention ſhould be paid to ſet them in ſuch directions as that expence and labour may be ſaved as much as poſſible.

It has been ſuggeſted by a late writer, that much loſs is often ſuſtained in theſe modes of folding ſheep upon turnips, eſpecially where they are cultivated under the broadcaſt ſyſtem, and it is the cuſtom to give the ſheep large folds or *breaks* at a time, from the occurrence of froſt and ſnow. In ſuch caſes he thinks the drill or ridge methods far preferable; it being eaſy to have ſheep-penns or turnip-trays made and fixed in ſuch a way as to conſtitute a ſort of moveable trough, the bars or trays being ſet near the ſide of the rows of turnips, and boards from ten to twelve inches in breadth, having

* Corrected Agricultural Report of Northumberland.

† Ibid. and Corrected Agricultural Report of Norfolk.

‡ Modern Agriculture, vol. II. p. 316.

ſtakes of ſuitable lengths, according to the depths of the ſoils, nailed to them, faſtened on the ſides from which the ſheep feed: the narrower the ſpaces the turnips are included in, the better. As it may be apprehended that the animals may get in among the turnips thus fenced off, it is remarked, that ſuppoſing they ocupy a regular ſpace of about twelve inches, the troughs may be made little more than a foot in width at the bottom, having a ſloping direction upwards. The trays or bars may likewiſe have an inclination towards the ſheep, and hang over the troughs or parts in which the turnips are incloſed, and thus prevent them from getting in.

In this way it is ſuppoſed the ſheep will have their food quite clean, and, by ſetting off at a time only the quantity neceſſary for a day, they may eat it with more avidity and without the danger of ſpoiling ſo much by their excrement.

If it ſhould be objected that this method is only ſuited to ſmall concerns, he maintains that, on examination, it will be found even on a large ſcale to be better in many reſpects, as well as conſiderably cheaper, as "on the *loweſt* calculation three ſheep may be kept in this way to two by the old method—perhaps even double the number, and they will fatten much ſooner*." It is added, on the principle that animals do not feed ſo well when a redundance of food is placed before them, that if the ſheep in ſuch caſes were driven into the ſtraw-yards during the night, and even to eat ſtraw in the morning, they would retain the turnips longer, and fatten quicker; and in the mean time the perſons employed in looking after them might move the hurdles a row further, and thus little time be loſt. If both feeding and ſtore ſheep ſhould be kept in this way,

* The advantages of this method are calculated by the author this way:—Suppoſe, ſays he, two hundred ſheep to employ one man and boy every day, and admitting the boy to be unneceſſary in the common method, but allowing one ſhilling per day for him; and eſtimating the ſame quantity of turnips to keep three ſheep that was employed for keeping only two; then three hundred ſheep may be kept where only two hundred were kept: and eſtimating the profit on one hundred ſheep at only two pence a-head per week, the amount will be 16*s.* 8*d.* for that length of time; and deducting from it the extra expence of 7*s.* for the boy, there will remain a clear profit of 9*s.* 8*d.* per week. But where the flock is larger, the profit will, it is obſerved, increaſe in proportion; as a man and boy are capable of managing four hundred ſheep. Two hundred are, however, ſufficient to be fed together; but by dividing four hundred equally, they can be managed by the above number of perſons.

The writer is, however, clearly of opinion that *two* ſheep may be kept in this way for *one* in the other. If ſo, ſays he, the amount would be 1*l.* 13*s.* 4*d.* per week, which in twenty weeks would come to 33*l.* 6*s.* 8*d.* a ſum that would more than clear the expences of the boy and the extra pen the firſt ſeaſon.

it would be advisable, he observes, to give the feeding stock rather more than are sufficient for the day, and to turn in the store sheep the succeeding day to consume what may be left. In this method the length of turnips that is necessary without much waste being committed may soon be discovered *.

This plan of consuming turnip crops may be economical and advantageous where the number of sheep is not great; but where it is very large, the constant trouble, difficulty, and expence, of procuring the hurdles and fixing the folds, must frequently render it incapable of being put in execution.

It has been found in the fattening of sheep with this root, that they make the greatest progress just before the turnips begin to run and form their seed-stems; a circumstance which probably depends partly upon the turnips containing at such periods the largest proportion of saccharine nutritious matter, and partly on the weather becoming more dry and warm. Hence it is a practice in some districts, towards the latter end of March or beginning of April, according to the state of the season, to mow off the shoots or stems that are advanced, with a scythe; as by this means, from the numerous lateral shoots that are sent forth, a more copious supply of green food is not only afforded, but the roots or bulbs of the turnips preserved longer in a state fit for use †.

In folding sheep on turnips, it frequently happens that after frosts or snows the hurdles get loose, and are either thrown down by the animals or the wind: great care should, therefore, be taken to have them at first well set into the ground, and secured by stakes of sufficient length, with proper *wyths* for tying them together.

The hurdles employed for this purpose are generally of two kinds, either *flatted* or *rodded*; the former being made from small poles of ash, willow, or other tough sorts of wood, by splitting them; and the latter from rods of hazel, or other suitable woods, by wattling them close together with suitable cross pieces like stakes. The *flatted* hurdle, or what in some districts is termed *waddle*, is much preferable to the *close-rodded* or *wattled* kind, as being much more durable. The first cost of them is, however, considerably greater ‡. There is also another sort of material made use of in some districts for this purpose; which is a sort

* Experienced Farmer, vol. I. p. 59. † Synopsis of Husbandry, p. 148.

‡ The former sort are mostly sold in the neighbourhood of London, at from about 16*s.* to 18*s.* a dozen, and the latter at from 10*s.* to 12*s.* the dozen. Toiling is generally from about 2*s.* 10*d.* to 3*s.* 6*d.* the rod.

of net-work, formed of ſmall cord, called *toiling*. This method is, however, more expenſive than that of hurdles, and leſs convenient; but may ſave ſomething in carriage, where hurdles are to be brought from a conſiderable diſtance.

Where turnips are intended for the feeding of cattle, or other ſorts of ſtock, in the winter and ſpring months, as they are extremely liable to be deſtroyed by the ſudden alternations of froſt and thaw, becoming in many caſes quite rotten and unfit for uſe, it is neceſſary to preſerve them by ſome means or other during that ſeaſon. For this purpoſe many different methods have been attempted, but probably without any of them being completely ſucceſsful. The only perfectly ſecure method of protecting them againſt the effects of intenſe froſts in ſuch ſeaſons, is perhaps that of having them drawn, topped, and piled up with dry ſtraw in houſes conſtructed for the purpoſe, contiguous to the cattle-ſheds, or feeding-ſtalls. This mode is, however, liable to objection, as being both troubleſome and expenſive, eſpecially where turnips are cultivated upon an extenſive ſcale. There is, however, another method which has been found very effectual, and which is leſs expenſive, and attended with but little trouble; which is that of ſtacking them upon the field where they grow, with layers of dry ſtraw betwixt thoſe of the turnips. This is a mode frequently practiſed in the county of Hertford, where they uſe one load of ſtraw to about thirty or forty tons of turnips. The manner of performing the buſineſs is this: the turnips being drawn during a dry time, and the tops and tap-roots removed, a layer of ſtraw is ſpread on a dry part of the ground, and a layer of turnips placed upon it to the thickneſs of eighteen inches or two feet; after this another layer of ſtraw, and then a layer of turnips, proceeding alternately in the ſame manner till the heap or ſtack is brought to a ridge or point; when the edges of the different layers of ſtraw are turned up, which ſerves to prevent the turnips from falling out, and at the ſame time affords a ſort of external covering to the heap, which is completed by being thatched well over the top with long ſtraw. They have alſo been attempted to be preſerved by being formed, without ſtraw, after the tops have been cut off and uſed as a green food, into what are termed *pies*, in the way that potatoes are ſometimes kept, being well thatched over on the outſide *.

It has likewiſe been ſuggeſted, that the difficulty of getting them up, and the dangers they are expoſed to during froſty ſeaſons, as well as the inconveniences

* Corrected Report of Middleſex, p. 289.

the cattle experience in feeding upon them from their coldneſs, may be prevented by piling them up in ſmall ſtacks, the tops outwards, near to the places where they are intended to be conſumed, with a little ſtraw between the different layers, covering them over with wattles or hurdles lined with ſtraw. If this practice was adopted on ſmall portions, it is ſuppoſed that much advantage would ariſe from it to the cattle in froſty weather, beſides the turnips being preſerved and prevented from exhauſting the land by remaining ſo long upon it. The ſame advantage may alſo, it is believed, be obtained, by ſinking beds about two feet deep, and of conſiderable breadth, in the ground where the turnips grow, putting five or ſix layers of turnips into each, with a little freſh earth between every one of them, and covering the tops over with ſtraw *. This method ſeems, however, only capable of being employed with ſafety where the ſoil is of a light porous ſandy quality, and of courſe not retentive of moiſture.

Ther are ſtill other methods that have been recommended for preſerving this root. The practice of drawing the turnips, cutting off the tap-roots, and carting them to a piece of paſture-ground adjoining the farm-yard, to be ſet together upright upon their bottoms, as cloſe as poſſible, has been found ſucceſsful in ſome diſtricts. The growth of the tops is, it is obſerved, in this way but little interrupted, thus conſequently affords a full compenſation for any waſte of bulb that may take place. And it is believed that the quantity of nutritious food is increaſed. The buſineſs is beſt performed when the weather is dry and windy, as the tops are then leſs brittle and the roots in the cleaneſt condition †. It has alſo been adviſed, by the intelligent author of the Corrected Report of the Agriculture of the County of Middleſex, that trials be made of carting the roots during the time of hard froſts into heaps, placed on bottoms of ice, and blending with them ice and ſnow in ſuch a manner as that they may be preſerved in a frozen ſtate as long as may be neceſſary, as the end of April. In this view they ſhould be placed either in proper buildings, or be well covered over with ſtraw, fern, or heath, and have earth placed over ſuch coverings in the ſame way as is practiſed in pying potatoes in particular diſtricts. This method, it is conceived, may be of great utility, as the frozen heaps will be ſecure againſt the thaws that take place on the breaking up of every intenſe froſt. In uſing the turnips thus packed up, it is recommended that they be

* Kent's Hints, p. 121. † Corrected Report of the County of Suffolk.

given to the animals after the froſt has been removed by putting them into cold water. And as the land may in this way be cleaned of ſuch crops at a more early period than uſual, great advantages may, it is contended, be gained to the crops that are afterwards cultivated on it.

As the living principle of vegetable roots is extremely liable to be deſtroyed by freezing, and their tendency to putrefaction thereby increaſed, it is probable, however, that in this way the turnips will be in great danger of becoming rotten, if they be not immediately conſumed after the heaps are firſt opened, and of courſe much loſs be ſuſtained.

It ſeems not improbable but that turnips might be well preſerved againſt ſevere froſts, at leaſt on a ſmall ſcale, by the application of ſtraw, fern, or any ſimilar light ſubſtance that has the power of reſiſting its operation, along the rows as they ſtand in the field, as is frequently practiſed in the garden culture of different kinds of vegetables. Such ſorts of materials might be applied in a cheap, convenient, and expeditious manner, by women and children; proper means, according to circumſtances, being provided for ſecuring them upon the plants; the matters thus employed being afterwards either removed or turned into the ſoil, as may be found moſt ſuitable and convenient to the cultivator.

Whenever the preſervation of this root is attempted in heaps, great care ſhould be taken not to have them too large or too cloſely packed together, as by that means the danger of their heating and being ſpoiled may be conſiderably leſſened.

By theſe means, it is obvious, turnips may be preſerved both as a winter and ſpring food for different ſorts of live ſtock, even in ſituations and ſeaſons that are the moſt expoſed and ſevere. Where ſheep huſbandry is carried on upon an extenſive ſcale it may indeed frequently be a more advantageous practice to have recourſe to this root for the ewes in the ſpring months, than to conſume them during the winter in fattening neat cattle; as in this way they will be better enabled to bring forth and provide for their lambs, which are circumſtances of great importance. But in mild ſeaſons, when ſheep do not ſtand in need of them, or are not kept in any great number, it may be the moſt beneficial method to apply them to the fattening or keeping of ſtore cattle; in the latter of which the animals will be brought into ſuch a ſtate of forwardneſs, as to be readily completed on graſs in the enſuing ſummer *.

* Corrected Report of the County of Perth.

In feeding turnips off by all ſorts of animals, attention ſhould be paid on their firſt being turned upon them, that they do not remain too long, otherwiſe they may be much injured by the diſtention which is occaſioned by their eating too greedily of them.

Ruta Baga, or Swediſh Turnip.—This is a root of the turnip kind, that has long been known, but only lately introduced into cultivation with much advantage. It has been conſidered by ſome as a variety of the yellow turnip, but it differs greatly from it both in its texture and properties. In its top it has ſomething of the appearance of the rape or the cabbage; the bottom, or that part of the root which is above the ground, is covered by a thick green tough cuticle or ſkin, and the internal fleſhy part is of a denſe firm conſiſtence, having a yellowiſh tinge. It is ſuſpected by ſome cultivators that there are two varieties of this plant, the one having a *white* and the other a *yellow* root, the latter being conſidered as much the beſt. This may, however, probably ariſe from their having been grown in the neighbourhood of plants of the turnip or cole kinds *.

It may be grown to advantage on moſt of thoſe ſoils that are too moiſt and heavy for the common turnip; but the land ſhould be brought into a tolerable ſtate of pulveriſation, and be well impregnated with manure, before the ſeed is put into the ground, or the plants put upon it. It is perhaps from the want of this due preparation of the land, and the putting in ſeed of a bad kind and at too late a period, that cultivators have ſo frequently failed in obtaining good crops of this valuable root.

Seed.—The ſeed ſhould be conſtantly collected from ſuch plants as have been tranſplanted, and which are the moſt perfect of their kind; as where this is neglected, the cultivator can never be certain of having his plants of the proper ſort. The quantity of ſeed that is made uſe of where the broadcaſt method is employed, is generally about two pounds to the acre; but where the drill plan is purſued a ſmaller proportion may be ſufficient; but as it is moſtly found difficult to produce a ſufficient plant, it may be adviſable never to be too ſparing in the article of ſeed. New ſeed is conſtantly to be preferred; and when the ſeaſon is dry, it may be of utility to have it prepared by ſteeping.

Time and method of ſowing.—As this plant is much ſlower in its vegetation than that of the common turnip, it ought to be put into the ground at an earlier

* Corrected Agricultural Reports of the North Riding of Yorkſhire and Nottinghamſhire.

period; by which means it will not only be more forward for the hoe, and more fully eſtabliſhed in the ſoil, but better protected from the attacks of the fly and the heats of the enſuing ſummer months. It has been the uſual practice to ſow this crop at the ſame time with that of the common turnip; but if put in three weeks or a month ſooner it will be found more advantageous, as from about the tenth of April to the tenth of May, or perhaps a little later in the northern diſtricts*.

Different methods are practiſed in raiſing this ſort of crop: ſometimes inſtead of ſowing the ſeed over the land in broadcaſt or drills, it is ſown upon beds of good earth; and after the plants are ſufficiently advanced, as when they are about the ſize of ſmall cabbage-plants, they are tranſplanted into the field, and ſet out in rows at the diſtance of eight or nine inches from each other, and a foot or more in the intervals. The buſineſs of tranſplanting ſhould, if poſſible, be performed when the weather is moiſt.

This may be the beſt method where ſuch crops are cultivated only upon a ſmall ſcale; but where they are grown more extenſively, the former are to be preferred, as being more expeditious and convenient, as well as more certain of affording a ſufficient plant.

After-Culture.—In this part of its management, the Swediſh turnip, from its growing in a more ſlow manner than the common one, requires more attention, in order that it may be kept perfectly clean and free from weeds, which under ſuch circumſtances are extremely apt to riſe. The operations of hoeing are to be performed in a ſimilar manner to thoſe for the common turnip, and repeated as frequently as may be neceſſary, keeping the mold well broken and laid to the roots of the plants. Theſe plants, beſides being ſubject to injury from the ſame cauſes as thoſe of the common turnip, are liable to be greatly hurt by hares, rabbits, and different kinds of birds, feeding upon both their tops and roots, which ſometimes are almoſt wholly conſumed by them.

In reſpect to the quantity of produce, there ſeems to be conſiderable difference of opinion among cultivators; but where the crop is put in ſufficiently early, and the ground prepared and managed in the manner that has been directed above, it will probably nearly equal that of the common turnip. And when it is conſidered that the roots are more ſolid, and abound more with nutritious matter, the *real* quantity of food which they afford may probably be

* Corrected Reports of the Northern Counties of Scotland, and Nottinghamſhire.

greater. In an experiment in the tranſplanted method, upon ridges of the ſame dimenſions as thoſe uſed for the common turnip, the produce was found, after they had ſuſtained the froſts, in the month of March, without either tops or tails, and when perfectly free from dirt, to be thirty-two tons on the acre *. And as an advantage in the feeding of horſes for a few acres, they have been eſtimated as high as thirty pounds the acre †. With others the crops, on trial, have likewiſe been found in general to be heavier than thoſe of common turnips; though in appearance, from the cloſeneſs of their texture, they did not ſeem to equal them ‡. It is obvious, however, that in common the quantity of produce on the acre muſt fall conſiderably below ſuch eſtimates, and the value of the crop in any application be rated much lower.

There can be little doubt but that this root may be of great utility and advantage in its application in the keeping of live ſtock in the late winter and early ſpring months, when the common turnip is liable to ſpoil and run to ſeed; as it is much more eaſy to preſerve in a ſound ſtate, being found, when taken up, to reſiſt the effects of the ſeaſon without any difficulty or trouble, though when left in the ground ſometimes liable to be injured §. By being ſtacked, and having the tops removed when they firſt begin to ſhoot, they may be kept till the latter end of May ‖, or even much later. In this way they ſupply the farmer with a valuable food, for the difficult and diſtreſſing period when turnips or other ſorts of food become ſcarce, uſeleſs, or exhauſted, and the graſs is not ready. Every cultivator, who has ground ſuitable for it, ought therefore to have a quantity of this ſort of crop proportioned to that of his live ſtock, to bring to his aſſiſtance the latter end of March and in April, or perhaps later.

Neat cattle are ſaid to fatten conſiderably faſter upon this root than that of the common turnip: and when given to milch cows, it has not it is ſaid the effect of injuring the flavour of the butter ſo much, but communicates to it a fine yellow colour ¶. It has alſo the property of rendering the milk more rich.

Sheep are found to be extremely fond of feeding upon it; but its hardneſs renders it more difficult of being eaten. And for hogs it is ſaid to be equal to

* Cloſe, in Bath Papers, vol. IX.
† Daikin in Corrected Report of Nottinghamſhire.
‡ Tuke's Corrected Report of the North Riding of Yorkſhire.
§ Anſtruther, in Young's Annals, vol. XVI.
‖ Cloſe, in Bath Papers, vol. IX. ¶ Ibid.

potatoes*. In the keeping of labouring horſes it is likewiſe aſſerted to be of the greateſt utility, rendering leſs oats neceſſary, and not proving of ſo laxative a nature as moſt other roots. The method of applying it in this intention is, after cutting off the tap-roots, to have the reſt of the bulb cut or chopped, being firſt well waſhed, into rather large pieces, by means of a ſharp hoe acting in a perpendicular manner, a ſuitable quantity of the roots being put into a ſort of high tub contrived for the purpoſe. More than are neceſſary for the conſumption of the day ſhould not be cut at a time, as they are liable to be much injured by becoming dry.

But though the *ruta baga* appears to be a root of conſiderable utility, eſpecially for the more northern diſtricts, where the common turnip muſt frequently fail from the ſeverity of the winters, it has been objected to as being injurious to the teeth of ſheep from its great hardneſs, as difficult of being raiſed from the ground on account of the number of its roots or fangs, and as hurtful to the land from its being continued upon it to ſo late a period: but where it is cultivated and managed in the manner that has been mentioned above, there will be little danger to be apprehended from the firſt; and in taking up the roots, where the ſoil has been in a proper condition for the crop, there is by no means that difficulty or trouble that has been ſuppoſed; and the hurtful effects of their remaining upon the land to ſo late a period, and thereby preventing it from being ſeaſonably prepared for other crops, may be eaſily obviated by drawing and ſtacking, or by arranging the roots cloſe to each other in an upright manner in any convenient ſituation, as in theſe ways they will not ſuſtain any injury from the ſeverity of the ſeaſon. There can be little doubt, therefore, from the many valuable properties which the root poſſeſſes, in addition to that of its continuing ſolid, juicy, and fit for the purpoſes of food, which is not the caſe with the common turnip after it has perfected its ſeed, that it may be found of great advantage as an aſſiſtant to turnips on all ſuch farms as ſtand much in need of late ſpring feed for the ſupport of live ſtock.

Cabbages.—That the culture of this vegetable is of great importance, as a winter and ſpring food for different ſorts of live ſtock, on all thoſe ſtiff and ſtrong ſoils that are too moiſt and heavy for the ſucceſsful practice of the turnip huſbandry, is ſufficiently ſhewn by the great advantages that have been derived from it in thoſe diſtricts where it is grown to a conſiderable extent. And this is

* Corrected Report of the North Riding of Yorkſhire.

farther enforced, by the little danger that attends the crop, and the largeneſs of the quantity of food that is produced; as it has been found to be conſiderably larger, in proportion to the ſpace of ground that is occupied, than that of turnips.

In the field culture of cabbages, ſeveral different ſorts are capable of being employed; but thoſe varieties that are the moſt uſeful as cattle food, and the moſt capable of withſtanding the ſeverity of the winters in this northern climate, are the *Scotch*, the *Drum Head*, the *American*, and the *Open Green* cabbage or *Spring Kale*. The firſt, when of the true firm flat-topped kind, has been found to be wholly incapable of being injured by froſt, except, in ſome caſes, a few of the outſide leaves. The ſecond ſort, or true drum-head, is likewiſe extremely hardy, and more cloſe in its texture than many other varieties, being of courſe very heavy in proportion to its ſize. It admits of being planted cloſer than the large American cabbage, which in particular ſituations is an advantage. This ſort is known in ſome diſtricts by the name of the *tallow loaf* cabbage; but it would ſeem to differ from it in ſome reſpects. As this kind is not found ſufficiently hardy to bear the effects of very ſevere froſts, a mixed ſtock is frequently employed, which is produced by planting it and the common red cabbage together, and, after the ſeed-pods are formed, cutting down the latter, and leaving the former for ſeed. This mixed kind, which is of a deep green colour veined with purple, beſides retaining the ſize of the drum-head, poſſeſſes the hardneſs of the red cabbage. The third, or American kind, has not only a large ſize, but continues good to a late period in the ſpring *. The laſt, or kale ſort, is perfectly hardy, and capable of being converted to uſe as a cattle and ſheep food, at the latter end of April or beginning of May, when other ſorts of green feed are extremely ſcarce and difficult to be procured †.

Beſides theſe, the varieties known by the titles of the *Flat Dutch*, the *Yorkſhire*, the *Savoy*, and ſeveral others, may be made uſe of in ſituations where the climate is more mild ‡.

The chief advantage of planting large-ſized cabbages in the field is, that of their being capable of being ſet out at ſuch diſtances as to readily admit of being cleaned and kept in order by the plough, without any loſs being ſuſtained in the quantity of produce. Where the ſoil is not of great ſtaple, and

* Bath Papers, and Young's Annals.

† Modern Agriculture, vol. II.

‡ Martyn's Edition of Miller's Dictionary, art. *Braſſica*.

the expence of hand labour reaſonable, the ſmaller ſorts may occaſionally be made uſe of with advantage.

From the great ſize, and the roots of plants of the cabbage kind penetrating into the ground to a conſiderable depth, they ſhould conſtantly be planted out in ſuch ſoils as are ſtrong and have a good depth of mold; as where this is not the caſe they ſeldom attain their full growth. The moiſt friable loams and loamy clays, on which turnips cannot be grown to advantage, are probably the beſt adapted to this ſort of crops; but they may be raiſed with ſucceſs on almoſt any of the heavier deſcriptions of land.

In the preparation of the ground, as the roots of the plants run deep, and ſtand in need of a large proportion of nouriſhment, a conſiderable degree of pulveriſation ſhould be effected, and the ſoil be well looſened to a good depth. Theſe effects may be produced in the moſt perfect manner, by repeated deep ploughing, and expoſing as large a ſurface as poſſible to the action of the froſts during the winter ſeaſon by laying the land up into pretty high ridges. Three ploughings are moſtly found ſufficient for this purpoſe; but the number ſhould always vary according to the nature and ſtate of the land. When this ſort of crop ſucceeds wheat, barley, oats, or beans, the land is generally ploughed up in the autumn by a pretty deep furrow, and formed into ridges of about three feet in width; in this ſtate it may continue till the ſpring, when it ſhould be well broken down by harrowing in different directions. It is then to be ploughed again, but with ſomewhat leſs depth than before. After this, as near as poſſible to the time of planting, the ground may again be well harrowed over, and a ſuitable proportion of good ſtable manure applied, as from fifteen to twenty three-horſe cart loads to the acre; or, where compoſts are made uſe of, from twenty to thirty, and immediately turned into, or incloſed in, the middle of the ridges. After this is accompliſhed, the land becomes ready for the reception of the plants. In ſome diſtricts, however, a practice prevails of ſpreading the manure upon the land and turning it in with the firſt ploughing. In this way the ground is ſuppoſed to be prevented from becoming too open by the action of the manure, and the danger of the plants being injured in droughty ſeaſons prevented. It is obvious, however, that in this mode much of the benefit to be derived from the manure muſt be loſt by its remaining ſo long incorporated with the ſoil before the plants are put in, and that the great advantage of having it in its moſt active and concentrated ſtate immediately below the roots of the plants muſt be wanting.

Seed.—In the ſelecting of ſeed for raiſing young cabbage-plants, great care ſhould be taken that it be procured from the moſt perfect plants of the different kinds, and ſuch as have ſeeded without any others of the *ſame tribe blowing* near them, as it is perhaps only in this method that they are capable of being kept of a true kind. In this intention it may be of great advantage to have the plants intended to ſtand for ſeed planted out by themſelves in a piece of ground at a diſtance from the others; and as birds are remarkably fond of the ſeed, well ſecured from them.

In purchaſing ſeed of this ſort, ſuch as is new ſhould always be preferred, as it not only vegetates much quicker, but is more to be depended upon for a proper ſupply of plants. In dry ſeaſons, ſteeping the ſeed in water, or ſome other liquid, may alſo be of utility. The beds on which the ſeed is ſown ſhould be of a good rich quality, well prepared by digging and the application of manure; as, where the ſoil is poor and not ſufficiently enriched by manure, the plants are apt to be weak and ſtinted in their growth, as well as much injured by the riſing of weeds. Much injury frequently ariſes to young cabbage plants from the ſeed being ſown too thick; care ſhould, therefore, be taken to have them properly thinned out whenever they come up in too thick a manner. One ounce or an ounce and a half of good ſeed may in general be ſufficient for ſowing a bed fourteen or fifteen feet long, and five or ſix feet in width, or for raiſing two or three thouſand good plants; in which proportion half a pound will afford more plants than are ſufficient for planting an acre *.

Time of Sowing.—The periods of putting the ſeed into the ground muſt depend much upon the intentions of the cultivator: where the produce is to be conſumed during the winter months, as in December, January, or February, the ſeed ſhould be ſown in July the preceding year, and the plants be put out in March, April, and May, the following year; but if it be intended for conſumption in March, April, or May, the ſeed ſhould be put in about the latter end of February or beginning of March in the former year, and the plants be ſet out the firſt or ſecond week in July in the ſame year. By continuing to ſow with regularity in the months of February, May, and July or Auguſt, ſucceſſive crops of young healthy plants may be ſecured, and the round of cabbage huſbandry be effectually preſerved. Theſe periods of ſowing and tranſplanting ſhould, however, be attended to with conſiderable exactneſs, in order

* Young's Annals, vol. V.

to ſecure good and certain crops, and the ſeed-beds be well protected from birds. And that the cultivator may not be diſappointed in the number of plants, it may be uſeful to ſow a little ſeed at different times, at the diſtance of a few days, always chooſing as moiſt a time as poſſible. But by haſtening or protracting the times of tranſplanting, or ſetting out the crops, the growth of the plants may be ſo managed as to have them ready for uſe either more early or later, according as circumſtances may require. In both the ſpring and autumn plantings it is, however, the beſt practice to be ſufficiently early; as in the former caſe the plants will have the great advantage of the ſpring ſhowers, and be leſs in danger from the heat of the ſummer ſeaſon, and in the latter more fully eſtabliſhed in the ſoil before the winter ſets in, as the growth of the plants after September cannot in any degree be depended upon in field culture. Beſides, from the length of time which is requiſite for their attaining their full ſize, it muſt always be advantageous to have them ſet out early. They ſeldom arrive at their full growth in leſs than four months.

By ſowing very early in the ſpring, and ſetting the plants out as expeditiouſly as poſſible, both full and forward crops may often be obtained. There is, however, in general, an advantage in the autumn plants, that though they be more liable to be injured in the winter by ſlugs, and other cauſes, they are in a ſtate to be planted out very early in the ſpring, while thoſe of the ſpring ſowings can ſeldom be ſet out till the ſummer is much advanced *. In this planting different methods have been attempted, ſuch as ſetting out the plants to ſtand the winter in the field, and letting them remain in the ſeed-bed to be put out in the ſpring; the former is the moſt adviſable in mild winters and ſheltered ſituations, as the crop will be much more forward; but in expoſed ſituations the latter may ſometimes be adopted with advantage.

By ſowing in May or June, forward crops of large cabbages may be procured the enſuing year, or coleworts for the following ſpring; but in this laſt intention they ſhould be planted cloſer together than uſual. In this way the loſs of weight, and danger of cabbage crops in the winter months, are fully obviated.

On the whole, the ſooner the autumnal plants are put out in the field after the froſts are over, the better; and the ſpring plants ſhould be placed out as ſoon as poſſible after them, as before the end of April. It is the cuſtom of ſome nice

* Miller's Dictionary, art. *Braſſica.*

cultivators to prick the plants out from the ſeed-beds, while very young, into other beds; and the practice is certainly advantageous, not only in checking their too forward growth, but in rendering them more fit for planting and leſs liable to run to ſeed when tranſplanted into the field *. The expence and trouble of this operation is, however, too great, where the cabbage culture is conducted on an extenſive ſcale, to admit of its being generally performed.

Method of planting.—In the planting out of this ſort of crop, care ſhould be taken to have the buſineſs performed as ſoon as poſſible after the land has been well ſaturated with rain; as in this caſe the plants much ſooner eſtabliſh themſelves in the ſoil, and fewer vacancies are left by their decay to be afterwards filled up. The plants are likewiſe much more readily raiſed from the ſeed-beds, and with much leſs injury to their roots, which is a matter of more importance than is generally ſuppoſed. The buſineſs is performed upon the land when in its flat or level ſtate, and alſo when raiſed into ridges by means of the plough; but the latter method is the more general, and ought probably to be preferred wherever the ſoil is much inclined to the retention of moiſture. On the lighter and more dry ſoils the flat ſurface may, however, be more adviſable.

The diſtance of planting muſt depend in a great meaſure upon the ſtrength and goodneſs of the ſoil, and the natural ſize of the variety of cabbage that is employed; but in general it ſhould be ſuch as that the ground between them may be cultivated and kept clean by the plough, and yet admit of bearing a full crop. It is obvious that where the plants ſtand thin they will attain a larger ſize, while in cloſe planting there will be a greater number upon the land, which may compenſate the diſadvantage of want of ſize. It ſeems probable, however, that both cabbages and turnips may be ſet out too thin, as the increaſe of ſize is not always equal to that of number.

It is the practice of ſome diſtricts, where this culture is well performed, to ſet them out regularly, at the diſtance of three feet each way, as in this method the plough in cleaning and earthing up the crops can be conducted both in a longitudinal and croſs direction, and of courſe the ſoil between the plants be not only ſtirred in the moſt effectual manner, but the moſt completely laid up to the roots of the plants, and their growth the moſt fully promoted. Where the larger varieties of cabbage are employed, and the land is ſufficiently ſtrong, this may

* Miller's Dictionary, art. *Braſſica*; and Young's Annals.

therefore in general be the moſt advantageous diſtance; but where the ſmaller varieties are made uſe of, and the ground is of a leſs ſtrong and rich quality, two feet and a half may be the moſt proper and beneficial diſtance. Other cultivators, however, follow a different practice; ſome preferring four feet by two feet and a half, while others adviſe only two feet by twenty inches, or even eighteen inches. In theſe diſtances the cabbages are, however, under the neceſſity of being hand-hoed between the plants in the rows; the intervals only being cleaned by the plough *. The culture cannot, of courſe, be by any means ſo perfectly performed; the ſoil in the former method being wholly removed except the ſmall portions immediately about the roots of the plants, while in theſe, much of it muſt remain untouched, and be not only left in a more foul condition for ſucceeding crops, but leſs beneficial in promoting the growth of the cabbages †.

But whatever diſtances may be thought the moſt advantageous, it will conſtantly be neceſſary to attend to the manner of ſetting them out, the ſize of the plants, and the mode of taking them up from the ſeed-beds, as much depends upon theſe operations being properly performed. In ſetting the plants out, in the ridge method, it is neceſſary to have them placed in lines as regularly as poſſible, according to the diſtances employed, along the middle or crown of the ridges, immediately upon the part in which the manure has been incloſed; as by having this accompliſhed in an accurate manner, they not only admit of being cultivated betwixt with more eaſe and convenience, but derive the utmoſt

* Marſhall's Rural Economy of the Midland Counties, vol. I. p. 211; and Young's Eaſtern Tour, vol. IV.

† The experiments and obſervations of Mr. Baker, in the cultivation of cabbages in the field, led him to recommend the following as the moſt ſuitable diſtances for the different varieties which he employed.

Varieties.	*Seaſon.*	*Diſtances.*
Long-ſided Cabbage	Winter Plants	2 feet by 4, or 18 inches by 4 feet.
Flat Dutch Cabbage	do. do.	do. by do. or do. by do.
Scotch Cabbage	do. do.	do. by do. or do. by do.
Flat Dutch Cabbage	Spring Plants	18 inches by 4 feet
Scotch Cabbage	do. do.	do. by do.
Turnip Cabbage	do. do.	1 foot by do.

The nature of the ſoils on which they were cultivated is not deſcribed.

For all the larger ſorts of cabbages on the different ſorts of ſtrong rich ſoils, the moſt advantageous diſtances may be three feet each way; and on the more light ſoils two feet and a half.

But for the ſmaller ſorts two feet each way on the ſtrong ſoils, and eighteen or twenty inches in ſuch as are light.

poſſible advantage from the manure, and at the ſame time, from its being more concentrated, require a ſmaller proportion to be employed.

The ſize of the plants is likewiſe a circumſtance of much conſequence, as the large ſtout plants not only take root with more certainty, but are leſs expoſed to danger from ſlugs and other cauſes*. In removing the plants from the ſeed or other bed, for the purpoſe of being planted out, it is alſo of much utility to have their roots as little broken or otherwiſe injured as poſſible. Moiſt or rainy weather is the moſt ſuitable for this operation; but in dry ſeaſons it may be well accompliſhed after the plants in the beds have been well watered. The number of plants that are employed muſt obviouſly be different, according to the diſtances at which they are planted; but from five to ſeven thouſand are generally ſufficient for an acre of land.

In ſetting the young plants out into the ground, it is neceſſary to ſee that the labourers fix them well in the ſoil, by applying the mold ſo firmly round their roots by means of the dibble, that they cannot be eaſily drawn out by taking hold of their uppermoſt leaves. The plants are moſtly dropped at proper diſtances, by women or children, and the dibblers follow, having a ſtick for marking the diſtances with in an exact manner. In this way an ordinary labourer will plant a quarter of an acre or more in a day, and an expert gardener nearly as much more. In the courſe of a fortnight or three weeks after the firſt ſetting out of the plants, it will be requiſite to fill up all the vacancies that have been produced by the failure of particular plants; in performing which a moiſt time, if it be poſſible, ſhould be choſen.

The expence of planting out, as well as of all the other operations in crops of this ſort, muſt be liable to vary greatly, according to the circumſtances of the ſoil, and the ſituation in reſpect to labourers. In Suffolk, according to the writer of the Corrected Report of the Agriculture of that diſtrict, it is in general about three ſhillings the acre; but in other places it is frequently a little higher, the whole charge of an acre being eſtimated as ſhewn below †.

* Corrected Report of Suffolk.

† *Expences of Cabbage Culture on one Acre.*

	£.	s.	d.
Charges for Rent	0	10	0
Tythes	0	1	6
Poor rates	0	1	3
Carried forward £.	0	12	9

Ploughing

After-Culture.—There is ſcarcely any ſort of crop that derives more advantage from having the mold or ſoil frequently ſtirred and applied to the roots of the plants, than that of the cabbage. It is only by a due repetition of theſe operations that the plants attain their moſt perfect growth and ſize. The work is accompliſhed by means of ploughs, horſe and hand-hoes. Where the plants are ſet out in a regular manner at ſufficient diſtances, the buſineſs may be performed in the moſt cheap and effectual way by the uſe of the horſe-hoe, or the common light ſwing-plough; but where narrow diſtances are employed, this work can only be well executed by means of the hand-hoe. Sometimes both the horſe and the hand hoe are made uſe of; as where the crop is planted cloſe in the rows, with wide intervals. The number of hoeings muſt in general depend upon the ſtate of the land and the nature of the ſeaſon; but three will in moſt caſes be neceſſary. The firſt ſhould be given about three weeks or a month after planting, according to the growth of the plants; and the ſecond at about an equal diſtance of time. The third may be repeated as the neceſſity of the crop may require, attention being conſtantly paid to keep the land perfectly clean from weeds, and the earth or mold well looſened and laid up to the plants. In the firſt operation it is uſual to turn the mold or ſoil from the plants, but in the ſubſequent ones to apply it up to them, which, where the plants are ſet regularly in ſquares at the diſtance of three feet, may be performed in both directions of the ground, in the moſt perfect manner. In this way the cultivator not only in a great meaſure avoids the heavy expence of hand-

	£.	s.	d.
Brought over	0	12	9
Charges for Ploughing land five times	1	0	0
Harrowing twice	0	0	6
Manuring	2	0	0
Seed-bed and ſeed, &c.	0	1	6
Planting out	0	3	0
Filling up deficiencies	0	0	6
Hand-hoeings	0	4	0
Horſe work in hoeing	0	4	0
Cutting and cartage one-fourth of a mile	0	15	0
£.	5	1	3

In this eſtimate, the whole of the expence of manure is, it is obſerved, charged to the cabbage-crop; but the advantage ought properly to be divided, which would leſſen the expence conſiderably.

hoeing, but contributes to the growth of the crop in the moſt effectual manner. In executing the work, by means of horſe labour, ſome make uſe of the horſe-hoe, others the double mold-boarded and common hoe ploughs; and it has been contended, that it may be effected with equal exactneſs and in an equally effectual manner by any common light ſwing-plough *.

After theſe hoeings have been accompliſhed, the hand-hoe may be occaſionally employed juſt about the roots of the plants, if there ſhould be neceſſity. And where the crops are planted out at narrow diſtances either wholly or in the rows only, it muſt altogether or in a great degree be depended upon for the after-culture of the crops. In theſe caſes, two or three hoeings are moſtly found neceſſary †. The expence of each hand-hoeing in ſuch crops is in general from two ſhillings to half-a-crown or three ſhillings the acre ‡.

Cabbage as well as turnip crops are liable to be injured by the attacks of animals of the inſect kind at different periods of their growth. While the plants are young and tender in the ſeed-bed, the *beetle* or *fly* often greatly injures or deſtroys them by its ravages. The plants likewiſe occaſionally ſuffer in the ſeed-bed from the attacks of the *caterpillar*, produced by the cabbage butterfly §, though leſs frequently, as this inſect makes its appearance in general too late to do much injury to field crops.

The *ſlug* ſometimes alſo does much harm to cabbage plants while young, and on their being firſt planted out, but afterwards they are little expoſed to its attacks. The depredations of the fly or beetle, as well as the caterpiller, may in general be in a great meaſure prevented by the ſowing or diſperſing of wood-aſhes, ſoot, or other ſimilar matters in a powdery ſtate, over the young plants on the firſt appearance of the inſects among them. And the ravages of the ſlug may be guarded againſt by the means that have already been recommended for turnips.

But beſides the attacks of inſects on the leaves of the plants, cabbages are ſubject to a diſeaſe in the roots, in which they become ſwelled out and knobby, and the plants weak and of imperfect growth. This vegetable diſeaſe has been ſuppoſed to be cauſed by the attacks of grubs below the ſurface of the ground, and to be chiefly prevalent where the ſame ſort of cabbages are ſown and planted on the ſame ſpots of ground for ſeveral years together ‖.

* Anderſon's Recreations in Agriculture, &c. vol. II. † See Hoeing.
‡ Corrected Report of Suffolk. § Papilio Braſſicæ.
‖ Stokes, in Witherin_'s Botanical Arrangements.

When care is taken to plant out the proper hardy ſorts of cattle cabbages there is little danger of their being injured by the ſeverity of the froſts during the winter months, as ſeldom more than a few of their large outſide leaves have been found to ſuffer. Many of the hardy varieties of cabbage have indeed been found to ſtand the winter froſts equally, or even better, where there are frequent thaws, than thoſe of the borecole or kale kinds; but the latter would appear better adapted as a green food, eſpecially for ſheep, in the early ſpring months, as it may be repeatedly eaten down or cut over *.

It is ſcarcely poſſible to aſcertain the quantity of produce that may be derived from an acre of land under a crop of this kind, as it muſt depend in a great degree upon the quality of the ſoil, the proportion of manure that is employed, the method of culture, the goodneſs of the plants, and the favourableneſs of the ſeaſon about the time of planting them out. It may probably in general be eſtimated at from twenty to thirty tons. In comparing the produce of cabbage crops with thoſe of turnips, in different modes of planting and on different kinds of ſoil, it was found, taking the beſt parts of the crops, that a medium acre of the former, on good land, well managed, produced twenty-five tons, and of the latter fifteen tons †.

The value of the crops muſt likewiſe be affected by various circumſtances, as the kinds of live ſtock by which they are conſumed, the manner in which it is accompliſhed, and the ſituation of the cultivator in reſpect to markets; but in common they may be calculated at from four or five to ſeven or ten pounds the acre.

In the application or expenditure of cabbage crops, as they are often liable to a conſiderable diminution in the quantity or weight of food which they contain, by ſtanding over the winter to the ſpring months, it may be the beſt and moſt economical practice to make uſe of them late in the autumn, while their leaves are in perfection, in completing the fattening of ſuch neat cattle or ſheep as have been brought conſiderably forward in the paſtures during the ſummer ſeaſon ‡. In this way there is much leſs loſs ſuſtained than is generally the caſe where they are ſuffered to ſtand for ſpring feed, by the decay and deſtruction of the outſide leaves and other parts of the plants. In the feeding of milch-cows at the ſame period they may likewiſe be of very great utility, as ſupplying a large proportion of green food, whether the whole plant be made

* Modern Agriculture, vol. II.

† Young's Annals, vol. XII.

‡ Young's Eaſtern Tour, vol. IV.

uſe of, or only the more looſe green leaves, which may often be removed without much injury to the cabbages *. In this method of application they have been ſhewn to be more beneficial than hay, given in any proportion, when only combined with ſtraw; and that the butter is not in any way injured by them while they are given in a ſound ſtate †. When employed in this way without any combination of other ſorts of food, as hay or ſtraw, an acre has been found to be ſufficient for four or five cows, and with ſtraw and a little hay for ſeven or eight ‡. In this mode of conſuming cabbage crops, the cows ſhould always be confined to the farm-yards, and not ſuffered to eat them after being ſcattered on the ground; as in the latter way the farmer muſt ſuſtain injury, both in the treading of his lands and in the loſs of a large portion of valuable manure. Beſides, we ſuſpect that ſuch ſort of food will go much farther when carefully applied in the yard, than when conſumed on the land, as much waſte muſt be unavoidable in the latter method ‖.

In the fattening of neat cattle, an acre of good cabbages may be nearly ſufficient for three beaſts of from forty to fifty ſtone each which have been grazed in the paſtures during the ſummer. A middle-ſized bullock conſumes, in general, of this ſort of food, in the proportion of about one hundred pounds in twelve hours; but much in this buſineſs muſt conſtantly depend on the ſtate of the ſtomach and the methods of feeding the animals. It would, however, ſeem probable, that cabbages poſſeſs the property of fattening cattle, not only more expeditiouſly but in leſs proportion than turnips; an acre of the former having been found to fatten one in four more than the ſame extent of the latter crop §.

In feeding this crop off with ſheep it has been obſerved, that ſuch as weigh about twenty pounds the quarter conſume in the proportion of from eight to ten pounds in twelve hours, half an acre being nearly ſufficient for one hundred ſheep when the crop is good. The cabbages, when run to ſeed in the ſpring months, are alſo conſumed with avidity by theſe animals; but this practice ſhould never be attempted, as much injury muſt always be ſuſtained by the land. The refuſe of cabbage crops may, however, ſometimes be uſefully applied in the more early ſpring months, before they begin to run, to the feeding of lambing ewes, as by ſuch means the quantity of milk is much increaſed, and the lambs of courſe better ſupported ¶.

* Corrected Report of Suffolk. † Farmer's Magazine, vol. III.
‡ Bath Papers. ‖ Corrected Report of Suffolk. § Bath Papers.
¶ Forby in Annals of Agriculture.

Store hogs are likewiſe ſaid to be kept upon this vegetable with advantage, and to prefer it to turnips. In the trials that we have been enabled to make with the finer breeds of this ſort of animals, we have not, however, found it a beneficial mode of applying ſuch crops, as they conſtantly reject both the cabbage and turnip for moſt other ſorts of food, and, unleſs prepared by heat, ſeldom eat them up clean.

Though few experiments have been made in the feeding of horſes with this ſort of food, it is probable that, after being chopped, cut, or ſhaved down by means of a ſtock or other knife, and blended with ſome ſort of dry cut fodder, it might be employed with great advantage both in the ſaving of other more valuable kinds of food and in promoting the condition of the animals; as, from their containing much ſaccharine matter, there can be little doubt of their poſſeſſing a highly nutritious quality. In this uſe, the more ſweet and delicate ſorts of cabbage ought probably to be preferred. That the application of this ſort of crop in this way has been ſcarcely attended to is fully ſhewn by the obſervation of Mr. Marſhall, in his account of the midland diſtricts, who regiſters it as extraordinary, that neither in that nor any other diſtrict an inſtance had been met with of cabbages being made uſe of in the way of food for horſes.

Where cabbages are employed for winter and early ſpring conſumption, it has been adviſed by ſome cultivators to have them cut or drawn while in full perfection, and piled up in houſes for the purpoſe, or ſtacked in the open air, being cloſely covered over by means of ſtraw, broom, ruſhes, or any other ſimilar cheap material; as in this way they are conſtantly ready and at hand, when they cannot be procured from the field, on account of the wetneſs of the land or the effects of froſt and ſnow *. The practice is ſaid to have been made uſe of in Germany with ſuch ſucceſs as to keep them in a good ſtate of preſervation during the whole of the winter ſeaſon. From the ſweet juicy nature of the vegetable, we are, however, diſpoſed to believe that it will be liable, in this method, to be injured, not only by taking on too much heat, but by becoming mouldy. Beſides, by keeping in ſuch ſtacks they, like the turnip, ſhrink conſiderably, and are probably much impaired in their quality.

In whatever manner cabbages are conſumed, it is of importance to the ſucceeding crops that they be wholly removed from the land in the early part of

* Farmer's Magazine, vol. III.

the ſpring, before they begin to throw up their flowering ſtems and run to ſeed.

On the whole, as cabbages may be cultivated at no great expence, are much leſs expoſed to danger, and capable of reſiſting the ſeverity of the winter ſeaſon more effectually, than turnips, and at the ſame time become equally palatable and nutritious to various kinds of animals, there cannot be any doubt but that they may be had recourſe to with great advantage in ſuch ſoils and ſituations as are not adapted to the turnip huſbandry, and eſpecially wherever a large proportion of green food is wanted for the ſupport of milch-cows in autumn and winter.

It has indeed been ſuggeſted by a late writer, that in caſes where turnip crops have either wholly or in part failed, and the ſoils are of an ordinary depth, the lands may be recropped with cabbages at a cheap rate, and with the greateſt chance of ſucceſs *. This may, therefore, be a point that deſerves the notice of the extenſive turnip cultivator on all the ſtronger kinds of turnip land.

The evidence that has been laid before the public by the intelligent writer of the Corrected Report of the State of Agriculture in the County of Suffolk ſeems to demonſtrate, that crops of this kind become injurious to the land both in their growth and the removal of the produce; and that the objections to their culture have chiefly been raiſed on theſe grounds. It appears probable, however, that, if the circumſtances of the quantity of produce in cabbage-crops being, in general, conſiderably larger than in thoſe of turnips, and that part of their deteriorating effects depends on the ſtalks or ſtems being improperly left in the ground till they ſprout afreſh, and by that means leſſen the fertility of the ſoil, as well as that of their being removed from the ground with more convenience and leſs injury to the land, from the nature of the ridges on which they are planted, be duly conſidered, they will not be found to impoveriſh the land on which they are grown, in any very great degree, more than thoſe of the turnip kind. The trials of different cultivators are likewiſe in favour of the ſame concluſion †. They may of courſe be conſidered as a proper and beneficial crop for all thoſe ſorts of land that are too ſtrong and retentive of moiſture for the ſucceſsful growth of the common turnip, eſpecially where dairy huſbandry is practiſed to any extent.

* Modern Agriculture, vol. II.

† Forby, in Annals of Agriculture, vol. XIX, &c.

Turnip Cabbage.—This is a plant that has been long known to the horticulturiſt, and which was attempted to be introduced into field culture many years ago, but without complete ſucceſs, notwithſtanding the reſults of the experiments that were then made upon it appear to have been much in its favour *. In this variety of the cabbage the bulb or apple is of a roundiſh flat form, appears principally above the ſurface of the ground, and is as it were an enlargement of the ſtem of the plant, the leaves that ſurround it having much reſemblance to thoſe of brocoli. It has ſometimes been cultivated under the title of *Cape Cabbage*, and often confounded with the *Turnip-rooted Cabbage* by thoſe cultivators who have not ſufficiently attended to the circumſtances by which they are diſtinguiſhed †. It ſeems to be the plant cultivated in many parts of Germany under the title of *Kohlrabi*, and which is ſaid to be extremely hardy.

The ſoils that are the moſt adapted to the growth of this plant are thoſe of the more light and dry kinds, that have ſome degree of elevation in reſpect to ſituation, and which are in a good ſtate of fertility from previous tillage.

The land is to be prepared by ploughing three or four times, in nearly the ſame manner as for the common turnip; being laid up in the autumn, in order to be rendered fine and mellow by the action of the froſts and other cauſes during the winter. After being thus well prepared, at the time of planting it is to be ploughed into ſmall two-bout ridges, and a ſuitable proportion of manure, according to the ſtate of the ſoil, turned in. On the ridges, when flatted by a light roller, the plants are to be ſet out.

Seed, and Time of Sowing.—In collecting the ſeed, the ſame method ſhould be purſued as has been adviſed for cabbages, in order that no adulteration may take place. In cultivating this plant, the ſeed is ſometimes ſown in beds in the fields, whence the plants are afterwards to be ſet out, and at others in drills or broadcaſt, where the plants are to remain, being only thinned out to proper diſtances by the hoe. The firſt method is probably in general to be preferred, though ſome cultivators contend that the plants ſucceed better when not removed from the places in which they were depoſited when ſown. Where the tranſplanting method is practiſed, the ſeed ſhould be ſown ſufficiently early to have the plants of a proper ſize, as of about ſix or ſeven weeks' growth, at the time of tranſplanting. About the middle of March or beginning of April may be the propereſt periods. The ſeed in theſe caſes ſhould be ſown very

* Tranſactions of Society of Arts, &c. † Bath Papers, vol. IX.

thin, and the weak plants afterwards thinned out, till they are left at not leſs than three inches diſtance from each other. Five or ſix ounces of ſeed will in general be a proportion ſufficient for affording plants for ſetting out an acre of ground. In the drill method the ſame proportion of ſeed may alſo in common be ſufficient, which ſhould be put into the ſoil about the beginning or middle of April; but if ſown later, as in May or June, it frequently ſucceeds. On the broadcaſt plan, from the plants not coming quickly to the hoe, the latter end of March may probably be the moſt ſuitable period of ſowing. In this method, the proportion of ſeed muſt be ſomewhat increaſed.

Method of Planting.—Crops of this ſort may be planted out either upon the plain ſurface of the ploughed ground, or after it has been thrown up into ridges in the manner deſcribed above; but the latter is by much the beſt method, eſpecially where the land is not perfectly dry. The moſt eligible time of performing the buſineſs of planting is, as in the common cabbage, when the land has had a good ſhower of rain; the operations of ploughing and ſetting out the plants proceeding together: but neither operation ſhould be attempted when the land is much ſoaked with rain, as much injury is not only done to the land, but the plants ſeldom thrive well *. In planting out different diſtances are practiſed, ſome preferring the diſtance of two feet from row to row, and eighteen inches apart in the rows where the ſoils are good, but in thoſe of inferior quality not more than twelve †; while others adviſe their being planted two and a half or three feet aſunder, on two-bout ridges ‡, the plants being placed as nearly as poſſible in the middle, immediately upon the dung, as has been recommended for cabbages.

After-Culture.—This buſineſs muſt be performed in different ways, according to the methods of ſowing or planting that have been practiſed. When the ſeed is put in by the hand, the crop can only be kept clean by means of the hand-hoe, which ſhould be applied as frequently as is neceſſary for the purpoſe.

In the drill mode, as well as where the crop is planted out with broad intervals and narrow diſtances in the rows, it may be convenient to make uſe of both the plough or horſe-hoe and the hand-hoe, employing the former in ſtirring and clearing the intervals, and the latter in keeping the ground between the plants clean. When the crop is planted on ridges, it is recommended, that as ſoon as the

* Bath Papers, vol. IX. † Miller's Dictionary, art. *Braſſicæ.* ‡ Bath Papers, vol. IX.

plants have become firmly eſtabliſhed in the ſoil, and weeds begin to appear, to throw a furrow from each ſide of them by means of a ſmall plough that is narrow behind, ſtirring the parts not thus moved by the hand-hoe, and after the decay of the weeds thus turned down, but before the plants get too large, to return them to their former ſituation, care being taken not to cover the hearts of the plants with the earth. Theſe operations may be repeated as frequently as the ſtate of the crop may require.

It may be neceſſary to obſerve, that in the after-culture of this plant, as it forms its bulb above the ſurface of the ground, the earth or mold ſhould never be laid up ſo much to the roots of the plants as in the common cabbage, as it may contribute not only to prevent the ſwelling of the bulbs, but promote their deſtruction.

In dry ſeaſons this plant may probably be cultivated with greater advantage than that of the turnip, as not being ſubject to the deſtructive attacks of the fly, and being leſs expoſed to danger from other animals that are liable to deſtroy crops of that ſort. When ſituated cloſe to turnips that have been almoſt wholly devoured by the fly, we have never perceived that plants of this kind were in the leaſt touched by it.

In good ground the bulbs or roots of theſe plants frequently attain a conſiderable ſize, the largeſt ſometimes weighing eight or ten pounds, and are ſaid to be much more hardy than the common turnip, though not ſo much ſo as the *turnip-rooted cabbage*. The quantity of produce on the acre is not probably in general equal to that of the common turnip.

Its application is chiefly in the feeding of neat cattle and ſheep, during the autumn or ſpring months, according as it may be ſown more early or late; but the moſt profitable conſumption of it is probably in the latter ſeaſon, as from the middle of March till it is removed from the ground. In this way it may become an uſeful aſſiſtant to crops of the turnip kind. For this uſe it poſſeſſes a particular advantage, in being formed, as it were, upon a foot-ſtalk above the ſurface of the earth; as it can on that account be more conveniently got at and removed during the time of froſt, or when ſnow is upon the ground, than the common turnip. The proportion of nutritious matter contained in crops of this ſort is conſiderable, and of a rich quality. Cows thrive extremely well on this food, when it is given them in a judicious manner. When fed off by ſheep, the beſt method is that of hurdling, in the manner practiſed for common turnips. In this mode of application they are ſaid to require little or no hay, even where the intention is to fatten the animals, as they make a greater progreſs with

them than on any other ſort of food, except that of oats. Both cows and ſheep have been found to feed upon the ſprouts with avidity, after their having bloſſomed and been cut and left to wither. But this practice ſhould ſeldom or never be attempted, as much injury muſt conſtantly be done to the land by the plants being ſuffered to run to ſeed. After the bulbs are ſhrunk and withered from being cut and packed up in houſes, they are ſaid to form a nutritious food for horſes.

Inſtead of cutting off the bulbs below the parts where they are formed, in order to preſerve them in houſes for the above purpoſe, it is the practice of ſome cultivators to plough them up wholly, uſing a common plough, without any coulter, having only a round ſhare with a blunt edge, for the purpoſe *. This is paſſed along under the rows, and performs the work with much eaſe and expedition.

Turnip-rooted Cabbage.—This is another plant of the cabbage kind that has been introduced into field-culture with conſiderable ſucceſs. It differs principally from the former in forming its bulb or protuberance below the ſurface of the ground, in having it of an oblong ſhape, and in the leaves having a conſiderable ſimilarity to thoſe of the common turnip.

The moſt ſuitable ſoils for the growth of this ſort of vegetable are thoſe of the more friable loamy kinds, or ſuch as have been formed by the gradual depoſition of earthy matters from the overflowings of large rivers or the ſea. But of whatever kind the ſoil may be, the particles of it ſhould have been well broken down and reduced by means of tillage, and not be too retentive of moiſture, when plants of this ſort are cultivated upon it.

In preparing the land for the crop it will therefore be neceſſary to have it brought into a conſiderable ſtate of pulveriſation or fineneſs, by repeated ploughings, and the paſſing of harrows over it; and alſo enriched by the application of manure, in the proportion of eight or ten waggon loads to the ſtatute acre, which ſhould be turned in with the laſt ploughing in forming the one-bout ridges for the reception of the plants. This is ſometimes performed by the common plough, but it may probably be executed with more exactneſs by one with a double mold-board.

Seed.—This is to be conſtantly collected from the beſt and moſt perfect plants of the kind, in the manner that has been already directed for the common cabbage. It ſhould likewiſe be employed while it is perfectly freſh, as

* Young's Annals of Agriculture.

ſuch ſeed as has been kept for ſome length of time ſeldom comes up well, or with much regularity. But where it is neceſſary to make uſe of it, the beſt method is to ſteep it in water for a few hours before it is ſown.

Time of Sowing.—This is to be performed ſooner or later, according to the intentions of the cultivator in reſpect to the conſumption of the crop; but for the ſummer planting, the beſt time may be about the latter end of March or beginning of April. For this purpoſe a piece of ground ſhould be prepared by repeated turning over during the winter, ſo as to become perfectly fine and free from weeds. This muſt now be covered over by ſome well-reduced farm-yard manure, adding a little freſh horſe-dung from the ſtable. This is then to be turned lightly in by means of the ſpade or plough, and a ſuitable proportion of ſeed ſown over the whole, being covered in by means of a ſtrong rake or light harrow *. As the plants riſe, attention is to be paid to the fly, guarding againſt its attacks by the uſe of wood-aſhes or ſoot, when it firſt appears.

When the plants are found to grow too faſt or advance too high in the ſtems before the period of ſetting them out in the field, ſo as to attain an improper ſhape not eaſily afterwards removed, it may be neceſſary to draw up the whole of the plants clean on one ſide of the bed, digging or turning the ſoil over in the place where they ſtood, to the depth of four or five inches, with the ſpade, putting the plants in the trenches in the proportion of forty or fifty in each yard, the roots being covered by the earth taken out of the ſucceeding trench, and ſlightly trodden down upon them. In this manner the whole of the plants that require it are to be entrenched; by which their improper growth may not only be checked, but the plants be rendered more fit to be ſet out in the field. Where the land for the ſeed-bed has, however, been properly prepared, and is perfectly freed from weeds, this proceſs will ſeldom be found requiſite †.

Method of Planting.—This ſort of plants may be ſet out in the ſame manner as the turnip cabbage, either upon the plain ploughed ſurface, or after the land has been raiſed into ridges, in the way deſcribed above. The latter is, however, to be preferred, eſpecially where the ſoil is inclined to be moiſt. They are planted at different diſtances, according to the goodneſs of the land; but

* Where this ſort of preparation has not been made, a piece of old graſs-land, reduced by paring and burning, may (Mr. Tugwell, an experienced cultivator, obſerves) be dreſſed in a ſimilar manner; or the ſubſoil of a winter ſheep-fold, the ſtraw, dung, and thin turfy material, having been previouſly removed.

† Tugwell in Bath Papers, vol. IX.

the moſt general practice is from two to two and a half or three feet. In the ridge method it is uſual to ſet them on the middle of the ridges, at the diſtance of two feet in the rows. The plants are to be carefully drawn from the ſeed-bed towards the latter end of June, for the ſummer planting, when of the ſize of good large cabbage-plants. And in order that as little injury as poſſible may be done to their roots, this buſineſs ſhould be performed immediately after rain, or after the beds have been well watered. They are then to be made up into ſmall bundles, and diſtributed by women or children ſingly along the ridges, or on the plain ſurface of the land, at proper diſtances, to be directly put into the ſoil by the dibblers; in doing which, they ſhould be plunged up to the place of the branching out of the leaf ſtems, the mold or ſoil being firmly cloſed about them in the manner recommended for the common cabbage plants. It is particularly neceſſary to attend to this laſt operation in dry ſeaſons, as the ſucceſs of the crop in a great meaſure depends upon its being properly performed *.

Care ſhould likewiſe be taken that a greater number of plants be not drawn from the ſeed-bed than can be planted out the ſame day, and that they be as little as poſſible expoſed to the action of the ſun and wind. It is alſo neceſſary for a few days to guard againſt their being pulled up by rooks or other birds.

After-Culture.—This is to be carefully attended to here, as well as in all other crops of a ſimilar kind. In about ten days or a fortnight, when the plants grow well, they will in general require the aſſiſtance of the hand-hoe, to clear the ridges and give the plants a ſlight dreſſing. And as ſoon afterwards as may be convenient, the intervals may be cleared either by the common plough or any other more ſuitable implement, by paſſing them twice along each, turning the furrows, where the land is clean and not too cloſe or compact, up towards the rows, being careful not to earth up the plants to too great a height; but where the contrary is the caſe, they ſhould be turned from them, ſo as to form a ridge in the middle of the interval, the implement being paſſed within a few inches of the plants in performing the operation. This ridge in dry ſeaſons ſhould be ſplit down and returned to the rows again in the courſe of a few days; another hand-hoeing being given as ſoon afterwards as may be found convenient. This laſt operation may frequently be unneceſſary on the more light and clean deſcriptions of land; but on the ſtrong and more compact ſoils

* Bath Papers, vol. IX.

it may be had recourſe to with advantage, both in reſpect to the preſent and future crop, ſo as to compenſate any expence that may attend it.

The produce in crops of this kind is frequently found, on good land, to be from twenty-five to thirty tons on the acre. In a practice of twenty years, the produce of an acre of this crop was on an average invariably found to to be equal to the ſupport of ſeventy ſheep for a month, in the moſt hungry, trying, and difficult part of the year: and this on land then not worth more than thirteen ſhillings the acre, but which contained between ſeven and eight thouſand plants, averaging above four pounds each in weight *.

As the plant is a native of a more cold and northern climate, it of courſe retains in ſome meaſure the late habits of the ſituation from which it was originally brought, and becomes proper for the purpoſes of feeding live ſtock at a later period in the ſpring than many other plants to which it has a reſemblance. It is ſeldom before the middle of April that the juice begins to riſe and the plant become proper for being fed upon. About this time, however, as is ſhewn by the buſhy appearance of its top, it begins to puſh forward and be in a condition to be made uſe of. When employed before this period, it is ſaid to be comparatively of little advantage, and in ſome caſes even injurious to the animals that feed upon it †.

Its principal application is in the feeding of ſheep, which animals are confined upon portions of the crop by hurdles, in the manner practiſed for the common turnip. The roots are, however, to be pulled up and prepared by being cut in two by means of an implement of the mattock kind, having a claw on one ſide nine inches long, with a tranſverſe edge at its end two inches in width, and on the other a ſort of cleaver; with this tool, acting as a lever by means of the handle, the roots are readily taken up; after which any dirt that may adhere to them is ſhaken off by a blow or two, and the roots ſplit by the cleaver. By this means the ſheep begin in the centre of the roots and proceed outwards, eating them with more eaſe and much more completely than in any other method. When they are not cut, the hard ſubſtance of the rind renders them difficult of being eaten by theſe animals ‡. One-year-old ſheep, or what are frequently denominated *tegs*, wethers, and all dry ſheep, may in preference be fed on this root; but when ewes and lambs are to be kept upon it, the hurdles muſt be ſo contrived as to admit the lambs to paſs through

* Bath Papers, vol. IX. † Ibid. p. 271. ‡ Ibid.

them to feed at large, as by this means both they and the roots will be much benefited *.

This root may be found on the whole, from its hardy and other properties, to conſtitute an excellent nutritious food for ſheep at thoſe periods in the ſpring when few other ſorts of green food can be procured or depended upon. The culture of it, in proportion to the quantity of ſheep that may be kept on the farm, ſhould not therefore be neglected.

This vegetable has been aſſerted to be capable of being preſerved for ſome time out of the ground, without its properties being in the leaſt injured; but as in moſt other bulbous roots, the beſt and moſt economical practice is probably that of employing it in its freſh ſtate. When thus made uſe of, there can be little doubt of its proving a valuable aſſiſtant to the turnip crop as a late ſpring feed for ſheep.

Rape or Cole.—This is a plant of the cabbage kind †, but which differs from it in not forming a cloſe head. As being of a hardy nature, and affording a large proportion of green food for the winter ſupport of ſheep and other animals, it has been ſome time introduced as an article of field culture. It has likewiſe been cultivated for a conſiderable length of time for the uſe of the ſeed, which is expreſſed in mills conſtructed for the purpoſe, in order to form the oil known by its name.

The ſoils moſt adapted to the culture of this plant are thoſe of the deep and more fertile kinds: when it is grown on lands that have been long in tillage, the friable loamy kinds are found to anſwer the beſt; but it may be grown with perfect ſucceſs on the fenny, marſhy, and other coarſe waſte lands, that have been long in the ſtate of graſs, after being broken up and reduced into a proper ſtate of preparation. As a firſt crop on ſuch deſcriptions of land it is often the beſt that can be employed. When ſown on old tillage lands, the method of preparation is pretty much the ſame as that which has been given for the common turnip; the land being ploughed over four or five times, according to the condition it may be in, a fine ſtate of pulveriſation or tilth being requiſite for the perfect growth of the crop. In this view the firſt ploughing is moſtly given in the autumn, in order that the ſoil may be expoſed to the influence of the atmoſphere till the early part of the ſpring, when it ſhould be again turned over twice, at proper diſtances from each other; and towards the begin-

* Bath Papers, vol. IX. † *Braſſic napus.*

ning and middle of June one or two additional ploughings ſhould be performed upon it, in order that it may be in a fine mellow condition for the reception of the ſeed.

But if the ſeed be intended to be put in upon lands that are newly broken up from the ſtate of ſward, they muſt be rendered perfectly clean and in a ſufficiently fine ſtate of mold for the reception of the ſeed, either by frequent ploughing in the common way, and afterwards harrowing the ſurface well by light ſhort-tined harrows; or by having recourſe to the practice of paring and burning, which may be performed in the manner already deſcribed *. The laſt is by much the moſt effectual, cheap, and advantageous method, where the ſurface contains a large quantity of coarſe graſſy matter, as it can ſcarcely be reduced by any other means without much time and trouble. This is the ſort of preparation that is generally employed when the crop is intended to ſtand for ſeed †.

If ſown on the firſt ſort of preparation, it is the beſt practice for it to ſucceed wheat or barley crops. When the former, barley or oats, with graſs-ſeeds, may be put in after it; but if the latter, it may be ſucceeded to the greateſt advantage by wheat, as it is found to be not only an excellent preparation for that ſort of grain, but to afford it of the fineſt quality; and by its being taken off early there is ſufficient time allowed for getting the land in order for the wheat crop ‡. Where the tillage land is not in a good ſtate of fertility, manure of the ſame kind and in the ſame proportion as for turnips ſhould be applied and turned in with the laſt ploughing for the ſeed.

Seed.—For this crop ſuch ſeed as has been perfectly ripened, is quite freſh, and has a fine black colour, is conſtantly to be preferred, as vegetating in the moſt perfect and expeditious manner. The quantity of ſeed that is made uſe of is in general from a quarter to half a peck, according to the manner of ſowing that may be practiſed. Where the crop is intended to be conſumed as a green food for animals, a larger proportion of ſeed may, however, be neceſſary than where the obtaining of ſeed is the chief object of the cultivator.

Method of ſowing.—The moſt common practice in putting this crop into the ground is that of diſperſing it in as regular a manner as poſſible over the ſurface of the ground by the hand, covering it by means of a buſh or other light harrow. Inſtead of this it is, however, ſometimes ploughed in when cultivated on the more light and open kinds of ſoil, a larger proportion of ſeed

* Section on Paring and Burning. † Modern Agriculture, vol. II. ‡ Kent's Hints.

being allowed, and the furrows made narrow with but little depth. In ſuch caſes this has been ſuggeſted as preferable to the former method *.

The drill method has alſo been practiſed with this crop, the ſeed being depoſited to the depth of one inch in rows on every other land, twelve inches aſunder. The ſuperiority of this mode over that of the broadcaſt appears conſiderable in the ſtatements that have been made of it, as the land is capable of being kept clean with leſs difficulty and expence †.

It has been ſuggeſted likewiſe as a deſirable method to ſow the ſeed in beds, for the purpoſe of being afterwards tranſplanted into the field and ſet out in the manner of cabbage-plants. Half a rood of land in this way would be ſufficient to furniſh plants for five or ſix acres. In this manner, as well as by pulling the plants from the places where they may ſtand too cloſe in the field, the vacancies that frequently occur in this ſort of crop may be filled up, the work being performed by dibbles ‡. And even the tranſplanting the whole crops by beginning at one ſide of the field, and proceeding gradually, from one land to another, till the whole is finiſhed, would, it is believed, be highly advantageous; as in this way the land would be provided with the beſt plants, and ſuch as are of equal ſize; and by their being placed at regular diſtances, the crops would ripen in a more equal manner, while at the ſame time free admiſſion would be given to the hoe, and the intervals be kept clean by narrow horſe-hoes ‖.

This buſineſs may be performed about the beginning of September or October, according to circumſtances. For this purpoſe the plough is made uſe of, the plants being placed by women in a leaning poſition in every ſecond furrow about a foot apart, and the roots covered by the next furrow; after which another is added, and more plants placed in as before, proceeding in the ſame manner till the whole is finiſhed. The plants of courſe ſtand at about the diſtance of eighteen or twenty inches by twelve. Where land that has been pared or burned is managed in this way, the firſt or ſeed-ploughing ſhould be in a croſs direction, and that for tranſplanting lengthways, in order to render the land dry in winter.

Theſe methods appear better adapted for ſuch crops as are deſigned for ſeed than for thoſe intended as green food for live ſtock; as by the perfect culture that

* Kent's Hints. † Amos on Drill Huſbandry.
‡ Marſhall, in Rural Economy of Yorkſhire. ‖ Ibid.

may be thus given them, and the uſe of manure, the inconveniences attending the ſeeding of rape crops may perhaps in a great meaſure be obviated.

When cultivated for uſe as green food, the ſeed ſhould probably be ſown more early than where the crop is to ſtand for ſeed, or be employed in both ways; but ſufficiently early to get a ſtrong leaf without running to ſtem the firſt autumn*. The middle of June and the laſt week in July may be the moſt proper periods.

After-Culture.—In the general broadcaſt method of cultivating this crop, proper attention in hoeing and keeping it clean from weeds is ſeldom beſtowed, though it is equally neceſſary as in almoſt any other, and in order to enſure a full and abundant produce ought never to be omitted. Where this buſineſs is attended to, it is the practice, after the plants have attained two or three inches in height, put out ſix leaves, and begun to ſpread and ſhew themſelves perfectly above the ground, to hoe them over by means of a hand-hoe ſomewhat ſmaller than that employed for turnip crops, ſetting the plants out to the diſtances of from ſix to eight or nine inches from each other, according to their vigour or ſtrength and the fertility of the ſoil. This is the only hoeing that is in general given; but in many caſes, as where the land is poor and diſpoſed to throw up weeds, much advantage may be derived from a repetition of the operation, not only in cleaning the ground, but promoting the growth of the plants, by ſtirring the mold round them. This ſhould be done about a month or five weeks after the firſt hoeing. The expence of performing the work once, is moſtly about ſix or ſeven ſhillings the acre.

But in the row methods, whether by drilling the ſeed or tranſplanting the young plants, the buſineſs of hoeing may be performed in a more perfect and cheap manner, on account of the greater diſtances of the plants admitting the earth in the intervals to be ſtirred by the plough or horſe-hoe, while hand-labour becomes only neceſſary between them in the rows. In this way a garden cleanneſs may be preſerved in ſuch field crops at no great expence.

When the produce is intended to be conſumed as green food, the crop will in general be ſufficiently advanced for the purpoſe, if there ſhould be a neceſſity for it, towards the latter end of November; but, except where the ſeed is to be afterwards taken, it is probably a much better practice to reſerve it as ſeed in the ſpring months. When cut or fed down in the autumn, the plants moſtly

* Miller's Dictionary.

advance ſo in the ſpring as to form a ſecond crop in April. But in this method of feeding off the crop care ſhould be taken that the plants are not pulled up and deſtroyed by the animals being confined too long upon them.

If the intention be to let crops of this ſort ſtand for ſeed, without feeding them down in the autumn, which is a practice often adopted; after they have been well cleaned by hoeing, nothing further is neceſſary till the latter end of June or beginning of July, when the ſeed becomes ripe. This is ſhewn by the pods putting on a browniſh appearance, and the ſeeds in the forwardeſt of them turning a little black. This ſhould be nicely attended to, as, if ſuffered to remain too long uncut, much ſeed may be loſt. They are uſually reaped with the ſickle and laid in thin *grips* or *reaps* upon the place where they grow, until they be in a proper condition for threſhing. This is known by the ſtraw becoming of a whitiſh colour, and the ſeed appearing perfectly black. If however they remain upon the ground too long, much of the beſt ſeed may be loſt, and if threſhed in too green a ſtate, much may be left in the pods, as well as what is threſhed out be difficult to cure or preſerve *.

In theſe caſes, the ſeed is threſhed out in the field upon cloths about twenty yards ſquare laid upon the ground, or what is better, upon wattled hurdles, ſo placed as to have an inclining direction, cloths being placed underneath to ſecure the ſeed. The rape is conveyed to the place by means of ſledges, the bottoms and ſides of which are lined with cloth in order to preſerve the ſeed that may eſcape in the operation. It is ſometimes likewiſe cleaned in the field, and put into ſacks for the market †. When large quantities of ſeed are brought quickly together, as they are liable to heat and become mouldy, it may be a better method to ſpread them out thinly over a barn, granary, or other floor, and turn them as often as may be neceſſary.

In ſome parts of Yorkſhire this buſineſs formerly conſtituted a ſort of feſtival ‡; but it is now much on the decline, the method of binding the crop in ſmall ſheaves and ſtacking it in the field being much adopted. The barn ought, however, to be preferred.

The expences of the different operations, ſuch as reaping, turning, threſhing, dreſſing, and depoſiting the ſeed in bags, may in general be eſtimated at from twenty-five to thirty ſhillings the acre.

* Marſhall's Rural Economy of Yorkſhire. † Kent's Hints.

‡ In the Rural Economy of that diſtrict Mr. Marſhall has given a full and very intereſting deſcription of the buſineſs.

When this ſort of plant ſucceeds well, and the ſeaſon is favourable for ſecuring the ſeed, the crops are extremely profitable to the cultivators, forty or fifty buſhels or more being frequently produced on the acre. Mr. Marſhall thinks, indeed, that on the whole "it may be conſidered as one of the moſt profitable crops in huſbandry. There have been," ſays he, "inſtances, on cold unproductive old paſture lands, in which the produce of the rape crop has been equal to the *purchaſe value* of the land *." The ſeed is ſold by the laſt of ten quarters, for the purpoſe of having oil expreſſed from it, by mills conſtructed for that uſe; the huſks, after the oil has been in a great meaſure ſqueezed from them, forming the cakes employed in feeding cattle. The price varies conſiderably, but lately has ſeldom been much below thirty pounds the laſt.

Rape crops are, however, precarious, both in the early cultivation and the ſecuring of the produce: being often much injured while young by inſects, ſomewhat in the manner of turnip crops; when in blow, or in the period between bloſſoming and forming the ſeed pods, in the ſpring, as about the beginning of May, by froſts, blight, and mildew; and in ſecuring the crop, if the time of cutting be not nicely attended to, or much rain fall, there is much danger of its being loſt or deſtroyed.

The culture of this crop for ſeed has been conſidered by many as objectionable, on account of the great degree of exhauſtion of the land that it is ſuppoſed to produce; but where it is grown on a ſuitable ſoil and preparation, with proper attention in the after-culture, and the ſtraw and offal, inſtead of being burnt, as is the common practice, converted to the purpoſes of feeding and littering cattle †, it may in many inſtances be the moſt proper and advantageous crop that can be employed by the farmer ‡.

The moſt general application of this ſort of crop is, however, as a green food for ſheep, in which uſe it is ſcarcely ſurpaſſed by any other vegetable, in ſo far as reſpects its nutritious properties, and thoſe of being agreeable to the taſte of the animals; but in quantity of produce it is inferior to both turnips and

* Rural Economy of Yorkſhire.

† It is remarked by Mr. Marſhall, in the work juſt noticed, that "the value of the ſtraw to cattle in winter is very conſiderable. The *ſtover* (pulls and points broken off in threſhing) is as acceptable as hay, and the tops are eaten with an avidity nearly equal to cut ſtraw, better than wheat ſtraw. When well got, the ſmaller butts will be eaten up clean. The offal makes excellent litter for the farm-yard, and is uſeful for the bottoms of mows, ſtacks, &c."

‡ Ibid.

cabbages. In this application the crops are fed off occaſionally from the beginning of November to the middle of April: being found of great value, in the firſt period, in fattening dry ewes, and all ſorts of old ſheep; and in the latter, for ſupporting ewes and lambs. The ſheep are folded upon them in the ſame manner as is practiſed in the conſumption of turnips. In this way they are found to pay from fifty to ſixty ſhillings the acre, that quantity being ſufficient for the ſupport of ten ſheep for ten or twelve weeks.

Rape has been found by experience to be ſuperior to turnips in fattening ſheep, and in ſome caſes even to be apt to deſtroy them by its fattening quality. It is likewiſe obſerved that that which is grown on freſh land has the ſtem as brittle as glaſs, and is ſuperior to every other kind of food in fattening theſe animals; while in that produced on old tillage land, the ſtem is tough and wiry, and has but little proof in it *.

When neat cattle are put upon this food in its green ſtate, care is neceſſary that they have not too much of it at firſt, as they are very liable to be *hoven* by it.

It has been ſuggeſted by a late writer, that the cultivators of this crop, in order to turn it to the beſt account, ſhould conſtantly keep in view the circumſtance of its being capable of a double application: as by feeding it off with ſheep in autumn, the ſucceeding crop may not be much injured; conſequently a large ſupply of winter food be procured, without the quantity of ſeed being much, if at all, leſſened. This is, therefore, conceived to be the moſt profitable management in crops of this kind †.

In ſome ſoils and ſituations this may be the caſe; but in general, feeding the crops leſſens the quantity of ſeed, as a much larger produce is moſtly obtained where this is not practiſed ‡.

Whether cultivated for the ſeed or as a green crop for the ſupport of live ſtock, rape may in many caſes be had recourſe to as a firſt crop in breaking up coarſe waſte lands, by paring and burning, with great advantage; but in the former view it can ſeldom be repeated with propriety at any very ſhort diſtance of time.

In letting the crop ſtand for ſeed, birds are to be carefully kept from it, as they are apt to devour large quantities from their being particularly fond of it.

* Corrected Report of Lincolnſhire.

† Modern Agriculture, vol. II.

‡ Ibid.

Carrots.—Though this valuable root has been cultivated in a local manner for a great length of time in this country, it is only within the laſt ten or fifteen years that it has been much applied to the purpoſe of feeding live ſtock by the farmer. It would ſeem to have been introduced into the ſouthern parts of the iſland from the Low-countries, where its culture and uſe as food for horſes had been long known and practiſed.

Although there are many varieties of the common carrot *, there ſeems to be only one that is proper for being cultivated in the field for the purpoſe of feeding animals. This is the ſort uſually termed the *orange carrot*, in which the colour is much more dark than in the other varieties, and the fleſh more ſaccharine and juicy. The root of this variety moſtly riſes to nearly double the ſize of that of the pale yellow kind.

The ſoils on which crops of this root ſucceed to the greateſt advantage are thoſe which have conſiderable depth of fine mold, either of the friable, loamy, ſandy, or vegetable earthy, kinds; but they may probably be cultivated to advantage on moſt ſorts, except thoſe of the ſtiff clayey and thin gravelly or chalky deſcriptions. The black deep vegetable, and the rich deep ſandy, ſoils, appear however the beſt calculated for this ſort of crop, as well as moſt other kinds: and the medium ſands and ſandy loams ſtand next, as beſt adapted to its culture †.

In the preparation of the land for carrot crops, as the roots of the plants are of the tap kind, repeated deep ploughing is particularly neceſſary, in order that they may be enabled to puſh downwards, and diſtend themſelves with facility in the ſoil; as in this ſort of huſbandry, where due pulveriſation is not effected to a conſiderable depth, the roots are liable to become forked and of very limited growth, ſending off numerous lateral roots, in conſequence of their inability to get down; by which the quantity and value of the produce are greatly leſſened. This deep tillage may be perfectly accompliſhed either by means of the trench-plough following the common one, or by the common one alone, with a good ſtrength of team; but the former method is to be preferred, wherever the lands are inclined to be ſtiff or heavy. Three ploughings are moſtly found ſufficient, where the land has been previouſly in a ſtate of tillage; but more may in other caſes be neceſſary. The firſt ploughing ſhould be made to the depth of ten, twelve, or fourteen inches, and be performed when the ſoil is tolerably dry, about the beginning of October. It may remain

* *Dancus Carota.* † Young's Annals of Agriculture, vol. XXV.

in this condition till towards the middle of February, when it ſhould be turned over a ſecond time, but in a croſs direction, to nearly the ſame depths. In March a third ploughing may be given, in order to the putting in of the ſeed. This may be ſomewhat lighter than the preceding ones. By the two deep ploughings being thus given in the autumn and winter months, the ground becomes more open and porous, from being ſo much expoſed to the action of the froſts and other cauſes, than could otherwiſe have been the caſe. At the laſt ploughing in March a ſuitable proportion of well-rotted farm-yard dung ſhould conſtantly be turned into the ſoil; the ſurface of the ground being immediately afterwards well reduced and rendered as level as poſſible by harrowing. The land is now ready for the reception of the ſeed. It has been fully ſhewn, by various trials detailed in the Annals of Agriculture and other books on huſbandry, that, though good crops of carrots may be occaſionally grown without the uſe of manure, it is only by the liberal application of that ſubſtance that the greateſt produce poſſible can be obtained, as they are in general found to bear a relative proportion to the quantity that may have been employed.

Seed.—The cultivator of carrot crops ſhould always be careful in ſaving his own ſeed, by ſelecting annually ſome of the moſt perfect and beſt-ſhaped roots of the preceding year's growth, to be ſet out ſeparately about the beginning or middle of March, in an open piece of ground, for the purpoſe. The ſeed will be ready about Auguſt. By this means the agricultor will always be in poſſeſſion of ſuch new or freſh ſeed as may be depended upon, which is ſeldom the caſe when purchaſed; old and imperfectly ripened ſeed being frequently blended with the new, by which the crops often either wholly fail, or come up in a very imperfect and unequal manner. Beſides, ſeed of the *pale yellow* kind, or what is termed the *horn carrot*, a ſort often cultivated in the Low-countries and in France, but which, as has been obſerved, does not grow to any thing near the ſize of the deep orange kind, is often diſpoſed of to the cultivators of this vegetable.

From the lightneſs of this kind of ſeed, and its adhering ſo cloſely together, other ſubſtances have been found neceſſary to be mixed or blended with it, in order that the ſeeds may be ſeparated, and ſown or diſperſed over the ground with more regularity. Saw-duſt, bran, aſhes, dry earth, and dry ſand, have been occaſionally made uſe of for this purpoſe; but the two firſt are probably the moſt proper, as being the moſt nearly of the weight of the ſeed. Some cultivators, however, think that it may be ſown more evenly without any of theſe

matters being incorporated with it, by only being well rubbed and paſſed through a ſieve, to ſeparate it perfectly, after having been well dried in the ſun *.

The proportion of ſeed that is made uſe of varies conſiderably among different cultivators; but from four or five to ſix pounds, when ſown in a broadcaſt method, may in general be the moſt ſuitable quantity, according as the land recedes from a ſandy quality †. But where the drill plan by a machine is followed, two pounds to the acre are ſaid to be fully ſufficient ‡.

The period of putting this ſort of ſeed into the ſoil is generally about the middle of March; but it ſhould not on any account be protracted later than the beginning of April. It may, however, be put in much earlier, when the land is in a ſtate of preparation for it, without any danger being apprehended from the ſeaſon

Method of Sowing.—The moſt common practice in putting carrot crops into the ground is that of the hand or broadcaſt method, the ſeed being diſperſed as evenly as poſſible over the land, after the ſurface has been reduced to a very fine ſtate of pulveriſation by harrowing, in order to provide a ſuitable bed for it to vegetate in; being then covered in by means of a light harrow. As the ſeed of the carrot is not of a nature to be depoſited with much regularity by the drill, and as the young plants can be eaſily ſet out to proper diſtances in the operation of hoeing, this is probably the moſt appropriate method of putting ſuch ſort of ſeed into the ground. And an additional proof of it is indeed found, in its being that which is almoſt univerſally adopted in thoſe diſtricts where carrot huſbandry is practiſed to the greateſt extent ‖.

With the view of having the after-culture of the crops more perfectly performed, and at the ſame time to ſave the great expence of hand labour in hoeing the crop, the drill method has, however, been attempted by ſome cultivators, but we believe without complete ſucceſs. The work is finiſhed in equidiſtant rows at the diſtance of from twelve to fifteen or eighteen inches from each other, according to the mode of hoeing that is practiſed. In this buſineſs ſome cultivators do not make uſe of drill-machines, but ſtrike the land into ſmall furrows by hoes or other implements contrived for the purpoſe, and then

* Annals of Agriculture.
† Corrected Report of Suffolk.
‡ Amos on Drill Huſbandry.
‖ Ibid.

caſt the ſeed over the ground by the hand, covering it in either by ſlight harrowing, or hoeing in the tops of the ridglets *.

In this method, where a drill machine is uſed, it has been adviſed by an intelligent cultivator to depoſit the ſeed to the depth of one inch in the rows, leaving the ſpaces of fourteen inches between them as intervals; the ſeed in theſe caſes being previouſly ſteeped in rain water for twenty-four hours, and left to ſprout, after which it is mixed with ſaw-duſt and dry mold, in the proportion of one peck and a half of each to a pound of the ſeed. The land is afterwards lightly harrowed over once in a place. Two pounds of ſeed in this mode is found, as has been obſerved, ſufficient for an acre of land †.

After-Culture.—As plants of the carrot kind while young are of a rather delicate nature, and do not riſe quickly, it is of great importance to keep them from being too much crowded together, and as free as poſſible from being ſhaded by weeds, in their firſt growth. This may be accompliſhed by means of very ſmall narrow hand-hoes about three inches in width, with handles not exceeding a foot and half or two feet in length, the labourers reſting upon their knees in making uſe of them. But as in this way there is conſiderable danger of too many plants being deſtroyed, where the workmen are not expert, it may be a better practice to have recourſe to hand-weeding, as in this mode the weakeſt plants may with certainty be removed until the reſt are left at their proper diſtances, and the weeds at the ſame time be wholly taken away. This operation may be rendered leſs difficult by having the crops ſown on ridges of ſuch breadths as may eaſily be managed by two or three perſons. By this means the buſineſs may indeed be performed in nearly as expeditious a manner as by the hoe, the trouble of ſeparating the weeds from the plants in that way being ſo conſiderable, and by the operation being performed in this effectual manner at firſt, there will be leſs trouble in the future hoeings. A ſecond hoeing ſhould be given in the courſe of three or four weeks from the firſt, according to the growth of the crop. This may be executed by means of the common hand-hoe, the operators carefully ſetting out the plants to their proper diſtances. Theſe vary in practice from nine to eighteen inches, twelve being that moſt generally adopted ‡. In the county of Suffolk, where carrot huſbandry is car-

* Young's Annals of Agriculture, vol. XXV.

† Amos on Drill Huſbandry.

‡ Annals of Agriculture, vol. XXV.

ried to a conſiderable degree of perfection, the moſt uſual diſtance is fifteen or eighteen inches each way. And at theſe diſtances they have found, by long experience, that the crops are finer and the roots larger, than when the plants are permitted to ſtand nearer to each other *. The tops of the plants by theſe diſtances have likewiſe full room to diſtend themſelves and cover the ſurface of the ſoil, by which it is kept perfectly moiſt and mellow, and conſequently in the beſt ſtate for the nutrition of the plants, as well as for the roots ſwelling out to their full ſize. A third hoeing is commonly practiſed ſome time in June, according as the growth of the plants or weeds may require. In this, the weeds are to be completely removed; and where the carrot-plants ſtand double or too cloſely together, the weakeſt plants are to be cut out, till the whole are left at their limited diſtances.

Further hoeings may occaſionally be requiſite, of which the cultivator muſt judge; as it is of the greateſt importance in this huſbandry to keep the land well ſtirred and the crops perfectly clean, their goodneſs materially depending upon ſuch operations being duly performed.

In the drill method the intervals may be cleaned by a ſmall light plough for the purpoſe, or the horſe-hoe. Even when executed by the hand-hoe, before the plants appear, as has been practiſed by ſome cultivators, it may conſtitute an advantage in the drill method †.

The expence of this buſineſs is different in different ſituations, according to the expertneſs of the perſons employed, and the method in which the work is performed. The average expence of different experimenters in various ſoils and ſituations, as ſtated by the intelligent editor of the Annals of Agriculture, is 1*l.* 16*s.* the acre; but in Suffolk, where the culture is familiar, and the work of courſe executed with much facility and expedition, it only coſts from 16*s.* to 18*s.* or a guinea the acre.

It is the practice with many cultivators of this uſeful vegetable to let the roots remain in the ſoil during the winter ſeaſon, to be taken up as they may be occaſionally wanted in the feeding of cattle or other animals. But as the crown of the root, by its retaining moiſture, is not only extremely liable to rot and decay in theſe ſeaſons, but the other parts of it from their ſaccharine quality to be greatly conſumed by grubs or other inſects below the ground; it is a cuſtom that ought not to be recommended, eſpecially as the crops can be pre-

* Modern Agriculture, vol. II.

† Legrand, in Annals of Agriculture.

ſerved with the greateſt eaſe and ſafety in any dry ſituation under cover. The difficulty or impoſſibility of getting up the roots in many caſes of hard froſt or deep ſnow, when they are wanted, alſo renders the cuſtom highly injudicious and improper. The taking them out of the ground is, therefore, to be conſtantly adviſed. The proper period of performing the buſineſs is in September or October, when the tops firſt begin to turn of a yellowiſh colour, and to loſe their freſhneſs. Theſe points ſhould be nicely attended to; as, if the work be delayed too long much loſs will be ſuſtained, in the tops being conſiderably decreaſed in bulk, and rendered almoſt incapable of being conſumed by ſwine or neat cattle; and when performed too early the roots will not by any means keep ſo well.

In taking up the crops two methods have been practiſed; thoſe of raiſing the roots by means of the plough, and the fork. The firſt is the moſt expeditious, but the roots are apt to be much broken; while by looſening the mold by three-pronged forks of ſufficient length, and at the ſame time drawing up the plants by the tops, they may be raiſed with great facility, and without ſuſtaining injury. This method, though perhaps rather more expenſive, ought in general to be adopted. After being raiſed from the ground, the roots ſhould be ſuffered to remain in the field for two or three days, that they may become perfectly dry. With this intention they are ſometimes piled up in ſmall heaps or wads. When fully dry, the tops are cut off, and the roots packed up in heaps with dry ſtraw, or, when in ſmall quantities, with dry ſand, in ſome dry cloſe building, a good covering of the former being laid over them. This is the moſt ſecure method. But when the crops are extenſive, they are ſometimes built up in the field or other convenient place, in rows or ridges, at the diſtance of two feet from each other, tops outwards, with dry ſtraw, to about four feet in height; the intervals being then ſtuffed, and the tops well covered over by it, ſedge or ſome other ſimilar material being applied by way of thatch. The outſides are alſo protected by ſtraw, kept cloſe by means of flakes or hurdles *. In this mode, which can only be practiſed in very dry ſituations, there is great loſs from the tops not being removed and eaten before they were put up. In dry ſituations they may, however, be well preſerved without this trouble or expence, in ſheds or other convenient places. But in whatever way they may be preſerved, they ſhould not be put up in too large quantities or too cloſely together, as they are liable to be much injured by heating.

* Annals of Agriculture, vol. II.

The expence of taking carrots up muſt vary much with the goodneſs of the crop, the nature of the land, &c. The average of ſeveral trials on different kinds of ſoil, under different ſorts of culture and management, and in different ſituations, has been calculated at 17*s.* 8*d.* the acre *. In many caſes it will not, however, much exceed half the ſum. *Cleaning*, *topping*, and *carting*, in the ſame trials, under ſimilar circumſtances, were found on the average to be 15*s.* 7*d.* the acre: the whole expence of procuring crops of this kind, in ſuch caſes, being in the proportion of ſix pounds four ſhillings and eleven pence the acre; or, in relation to the quantity of produce afforded, about two pence three farthings the buſhel: the quantity of produce, on an average of the whole of the different experiments, being about five hundred and twenty-nine buſhels the acre †. The expence of cultivating this root on a poor ſandy ſoil, not worth more than five ſhillings the acre, is ſtated as below by the writer of the Report of the State of Agriculture in the County of Suffolk ‡: the produce in this caſe being about two hundred buſhels on the acre. The firſt coſt, of courſe, about three pence the buſhel. In medium crops on middling ſorts of land the produce may in general be from three hundred to three hundred and fifty buſhels on the acre ‖, the expences of cultivation being from three to four pounds. On comparing them, in theſe crops, with thoſe of the turnip kind, the difference has been found to be about one pound in favour of the latter §.

It is obvious from the above ſtatements, that though the expences of carrot huſbandry are very conſiderable in moſt ſorts of land, the largeneſs of the produce, its utility in the feeding of various kinds of live ſtock, and the improved condition in which the ſoil is left by it, warrant its introduction, wherever the cultivator is poſſeſſed of thoſe ſandy or other deſcriptions of ſoil that are ſuitable for it, as the moſt advantageous that can be purſued.

* Annals of Agriculture, vol. XXV. † Ibid.

‡

	£.	s.	d.
Deep ploughing once	0	7	0
Expence of ſeed and ſowing	0	4	6
Hoeing	1	1	0
Taking up and topping 5 loads, of forty buſhels each	0	5	0
Carting	0	5	0
Rent, tythe, and rates	0	7	0
	£. 2	9	6

‖ Modern Agriculture, vol. II. § Ibid.

The conſumption of this ſort of crop has been chiefly in the feeding of horſes, and the keeping of different ſorts of cattle, ſheep, and hogs; but as, from its firm fleſhy nature, and its containing much ſaccharine matter, it is found to poſſeſs the property of quickly rendering animals fat without being employed in very large proportions, its moſt advantageous application would ſeem to be in that view. It has indeed been obſerved, on the authority of experience, that it may be made uſe of with the greateſt profit in the fattening of bullocks *. And the experiments of other cultivators have ſhewn, that in fattening other ſorts of animals it is equally if not more advantageous †. When made uſe of in this way, the quantity muſt be proportioned to the ſize of the animal, a ſuitable proportion of good hay or cut chaff being employed at the ſame time. In the early parts of the ſeaſon, while the root is in its moſt juicy ſtate, more of this dry food ſhould be given than afterwards, when much of it is diſſipated by keeping.

This root is highly reliſhed by all ſorts of cattle; ſtore neat ſtock are found to thrive well upon it; and when given to milch-cows, the quantity of both milk and butter is ſaid to be greatly increaſed, without their flavour being in any way impaired; but crops of this nature can perhaps only be employed in this way with profit under particular circumſtances, as where there is not live ſtock to be fattened.

In the fattening of ſheep, it has been found in ſome diſtricts to be particularly beneficial, one acre of it being equal to two and a half of turnips ‡. Hogs readily become fat upon this food, when it is prepared by boiling; but when given in a raw ſtate, it has not, in ſome trials, anſwered well ‖; though in others the animals have ſoon been made fat by it.

But the moſt general conſumption of carrot crops has been in the feeding of working horſes; in which they have ſaved much corn, without the animals ſuſtaining any inconvenience. In this application the general daily allowance is from forty to fifty pounds each horſe. When joined with cut chaff and a little hay, they are found to keep the animals in proper condition for performing all the different purpoſes of farming labour. This ſort of food is moſtly begun to be given them towards Chriſtmas, and continued till the latter end of April. It is ſuppoſed by ſome, that it is better for ſpring than winter uſe; they of courſe give a much ſmaller proportion at the latter ſeaſon. This is probably

* Corrected Report of Suffolk.
† Young's Eaſtern Tour.
‡ Modern Agriculture, vol. II.
‖ Eaſtern Tour, vol. IV. p. 99.

owing only to the root being more freſh and ſucculent, and of courſe requiring more dry food to be joined with it.

The value of crops of this nature muſt be different according to the way in which they are applied in their conſumption *. The difference has been found to be from two pence halfpenny to two ſhillings; but in general it may be from ſix pence to eight pence or ten pence the buſhel, which on four or five hundred buſhels is conſiderable.

On the whole, from the facility of cultivating carrot crops, the little danger that attends them, their great application in feeding and fattening various kinds of animals, the vaſt quantity of manure they produce, and their utility in preparing the land for grain, they may in general not only be conſidered as ſuperior to turnips, but much better adapted and more advantageous on all pure ſands or light ſandy loams. This is indeed ſtill more ſhewn by their having been found by experiment to be capable of being grown with profit in ſucceſſion on the ſame land †; as, though the cultivator may only have a ſmall portion of ground ſuitable for this root, he may conſtantly be provided with it. Notwithſtanding the neglect that has attended it, probably from its properties and value not having been well aſcertained, it ſhould be more generally cultivated wherever the ſoils are proper for it, not only as the means of ſaving the great conſumption of oats and beans by horſes, but as of much utility in the feeding and fattening of different ſorts of live ſtock.

It ſeems probable too that carrots, after being prepared by boiling, might be converted to the purpoſes of fattening different kinds of poultry with great advantage, as they are extremely fond of them. Parſnips have been found highly uſeful in this mode of application, as will be ſeen below.

* In the trials of different experimenters, as ſtated by Mr. Young in the twenty-fifth volume of the Annals of Agriculture, the reſults were theſe:

Application.	*Value per buſhel.* £.	s.	d.
In feeding all ſorts of cattle	0	0	2½
The average in different ways	0	1	0
In fattening oxen	0	0	6
In fattening hogs, boiled	0	2	0
Uſed inſtead of oats for horſes	0	0	6
In fattening hogs, raw	0	0	8
In fattening ſheep	0	0	4

† Young's Eaſtern Tour, vol. IV.

It has been attempted, in order to render the large tops of carrots uſeful, to convert them into a ſort of hay, by mowing them over while green and juicy, without wounding the heads of the roots, and afterwards drying them on the ground. In this way two tons of fodder are ſaid to have been produced from an acre of land *. It is obvious, however, from plants of this ſort taking in part of their nouriſhment by their leaves, that if cut while perfectly green, much injury muſt be done to the growth of the roots But, independent of this, ſuch a method muſt be uneconomical from the great loſs that muſt be ſuſtained in rendering the tops dry and proper for being put together in ſtacks. It is a much leſs waſteful practice to take up ſuch crops gradually, making uſe of the tops in the feeding of hogs, neat cattle, horſes, or ſheep; all of which are extremely fond of them.

When it is thought neceſſary to waſh the roots before they are made uſe of in the feeding or fattening of animals, it may be performed with eaſe and expedition in the ſame manner as has been recommended for potatoes.

Parſnips.—This is another plant of the tap-rooted kind that has been occaſionally cultivated, though in a very limited manner, for the purpoſes of huſbandry. The garden parſnip † is the ſort employed in field culture: which when properly cultivated has a long fleſhy root, conſiderably larger than the carrot, and equally ſweet, nutritious, and juicy; and, from its being capable of withſtanding the ſeverity of the winter ſeaſon, is probably better adapted to the northern parts of the iſland. From its eaſy culture, and the great quantity of food that it affords, it would ſeem to demand more attention than has hitherto been beſtowed upon it by the Britiſh farmer.

The ſoils moſt ſuited to this plant are thoſe of the rich, deep, mellow, loamy or ſandy kinds, in which the roots can run down to a great depth, and diſtend themſelves with facility. On the gravelly and the pure clayey ſoils they can never be cultivated to much advantage ‡.

Whatever the nature of the ſoil may be on which this root is cultivated, it muſt, in the ſame manner as for carrots, be broken up to a conſiderable depth, and have the mold brought into a fine ſtate of pulveriſation. In diſtricts where the plant is grown for the purpoſes of huſbandry, there are two different methods purſued: the firſt is that of ploughing the ground by means of a light

* Baker, in Tranſactions of Dublin Society.

† *Paſtinaca ſativa.*

‡ Hazard, in Bath Papers.

plough, which is regulated in the fore part by two wheels being fixed to it, one of which runs in the furrow, and the other on the unploughed land, the former being fourteen or fifteen inches higher than the latter, and which opens down and turns the mold to the depth of about five inches; after which, the furrow is dug down with a ſpade, ſo as to form a trench of about ſixteen inches in depth, proceeding in the ſame way till the whole of the field is prepared: but the latter, which is by means of two ploughs of different kinds, one following in the ſame track after the other, is by much the moſt expeditious and economical. The light plough juſt deſcribed anſwers very well in performing the firſt part of the operation; but in the ſecond, one of the *trench* kind muſt be made uſe of, by which the mold is raiſed from the bottom of the furrow made by the firſt, and applied over the ſlice it had turned up. In this way the ſoil is not only broken up to a great depth, but the ſurface left in a fine ſtate of mold. Where this ſort of tillage is practiſed, the work is generally performed in the more dry ſorts of land about the middle of February; and in thoſe that are retentive of moiſture, towards the latter end of March. The ground, after being thus expoſed to the influence of the atmoſphere for a week or a fortnight, is harrowed lightly over in order to render it fit for the ſeed. In ſome caſes, however, a ſlight ploughing is given to the lands intended for this crop in September, the uſe of the other ploughs being had recourſe to in January in the ſucceeding year. The principal object in this buſineſs is that of looſening and rendering the ſoil mellow to as great a depth as poſſible.

The uſe of manure is not in general ſo neceſſary for this crop as many others; but where the land is not in tolerably good heart, it ſhould conſtantly be employed in ſuch proportions as may be thought ſufficient. The well-rotted farm-yard dung is in common the beſt adapted to this crop, being turned into the ſoil by a light ploughing immediately before the time of putting in the ſeed.

Seed.—Seed for this crop ſhould be collected from the beſt and moſt perfect plants, by tranſplanting*, in the manner that has been already directed for other ſorts of ſeed-crops; and ſhould always be made uſe of while perfectly freſh, old ſeed frequently either wholly failing or coming up with great irregularity.

The proportion of ſeed that may be employed muſt be different, according to the nature of the ſoil, and other circumſtances; but in general about four-twelfths of a buſhel to the acre may be ſufficient†.

* Communications to the Board of Agriculture, vol. I. † Ibid.

Time and method of ſowing.—The moſt uſual period of putting this kind of crop into the ground is in the early part of the ſpring, as ſoon as the froſts will admit of it; as about the beginning or middle of February. It is, however, ſometimes ſown in the autumn of the preceding year, immediately after it has been ripened and collected from the plants, as about the beginning of September. It is contended that in this way the plants will appear more early in the following ſpring, and of courſe become large and ſtrong before any weeds riſe to injure them: and that as the plants are in little or no danger from the ſeverity of the winter ſeaſon, this is, on the whole, the moſt eligible period. Where the ſoil is, however, in a proper ſtate of preparation, as there can be no apprehenſions of their being inconvenienced by the growth of weeds, the former may be the moſt ſafe and convenient ſeaſon for the purpoſe.

If the tranſplanting method be intended to be practiſed, which may perhaps ſometimes be attempted where the land cannot be got into a ſuitable ſtate of preparation for receiving the crops at the above period, but which does not in general anſwer with tap-rooted plants, the parſnip ſeed ſhould be ſown at the time juſt mentioned, upon ſmall beds of good rich ground, rendered fine by repeated digging and raking, either in the garden, or the field in which they are afterwards to be planted; the ſeed in this caſe being ſown thinly, and the plants, where they ſtand too cloſely together on coming up, thinned out to proper diſtances, in order that they may become ſtrong at the time of tranſplanting in the ſpring.

The moſt uſual method of ſowing the parſnip ſeed is in broadcaſt over the land, being afterwards covered in by means of a light harrow. It is probable that this ſort of crop might be ſown in rows, either by means of the drill machine, or by having ſmall furrows made in the land and ſowing the ſeed over it in the broadcaſt method, afterwards lightly harrowing it into them. In this mode, by having the rows at ſufficient diſtances, the crops might be kept more clean and at leſs expence than in the ſimple broadcaſt method.

In tranſplanting this ſort of crop, great care ſhould be taken to injure the roots of the plants as little as poſſible in drawing them from the ſeed-beds. They are then to be put into furrows made by the plough to the depth of five or ſix inches, at the diſtance of eight or ten inches from each other, the plants being regularly diſperſed along the rows for the purpoſe. In performing this work, care ſhould be taken that the roots of the plants are not bent, and that the plants ſtand upright, their leaves being free from mold. After the earth has

been brought about them, which ſhould be done by perſons immediately following the planters for the purpoſe. The next row is to be put in in the ſame manner, at the diſtance of eighteen inches from the former, and the whole field finiſhed in the ſame way. The dibble is objected to in theſe caſes, on account of its rendering the ground hard, and improper for being penetrated by the tender fibres of the roots of the plants *. This method of putting in parſnip crops is beſt performed in the beginning of April, if the ſtate of the ſeaſon will permit.

In diſtricts where parſnips are much cultivated as a field crop, it is the common practice to have beans at the ſame time with them, either planted in ſingle rows, at the diſtance of four feet and a half, and about eight or ten inches from each other, or double ones at the diſtance of twelve feet and eighteen inches in the rows. In this manner two crops are obtained from the ſame piece of ground; but unleſs care be taken to remove the beans in good time, great injury may be done to the parſnips. As, though there may have been much leaf and ſtem before, the roots of theſe plants begin to ſwell out and acquire their ſize towards Auguſt, the beans ought never to be ſuffered to remain longer than that period upon the ground †. It may, however, be better in many inſtances, eſpecially where they are cultivated in the drill method, to have only the parſnip crop; as, while the land can be kept equally clean, the roots will probably be much larger in ſize.

After-Culture.—Crops of this ſort require to be kept perfectly clean and free from weeds during the early part of their growth; frequent hoeing and weeding are, therefore, to be practiſed. Where cultivated in rows at ſufficient diſtances, the intervals may be cleaned by the plough or horſe hoe. It is ſometimes uſual, where this ſort of crop forms a part of field huſbandry, to have recourſe to the harrow before the proceſs of hoeing or weeding is begun. This muſt be performed about the time the ſeed firſt begins to germinate; as by harrowing too ſoon the weeds will not have riſen, and if deferred too long, there will be danger of deſtroying the buds of the parſnips. This is ſuppoſed more neceſſary on the ſtiffer ſorts of ſoil, as it renders them more eaſily weeded. The firſt weeding may be performed about the beginning or middle of May, according to the forwardneſs of the plants, being at this operation only partially thinned out where they appear to ſtand much too cloſe together. The ſame operation is to be again performed about the beginning of July; when the

* Bath Papers.

† Communications to the Board of Agriculture, vol. I.

plants muſt be carefully ſet out to the diſtance of ſix inches. This ſort of work is executed either by means of a ſmall fork with two prongs, or a kind of very ſmall ſpade having a ſhort handle; the labourer, in making uſe of it, kneels on one knee, and, holding it in his right hand, digs and turns the mold, while with his left he pulls up and removes the weeds *. After this ſecond weeding nothing further is found requiſite in the parſnip culture.

As this ſort of root ſtrikes downwards to a great depth, and of courſe draws much of its nouriſhment from below, it may with propriety be introduced after moſt ſorts of fibrous-rooted crops. There is little hazard in the cultivation of parſnip crops, except from the falling of too much rain immediately after ſowing, by which the ſeed may be in danger of being waſhed away; or, when dry weather ſucceeds, from the baking of the land rendering the plants incapable of puſhing their roots ſufficiently down. They are ſeldom injured by froſts or other cauſes during the winter ſeaſon, or liable to be deſtroyed by any kind of inſects.

The produce of this ſort of crop, when cultivated on a proper ſoil and in a ſuitable manner, will, from the great ſize of the roots, be probably equal if not greater than that of carrots.

The application of this root is much the ſame as that of the carrot. In the fattening of cattle it is found equal if not ſuperior; performing the buſineſs with as much expedition, and affording meat of exquiſite flavour and a highly juicy quality. The animals eat it with much greedineſs. It is reckoned that thirty *perches*, where the crop is good, will be ſufficient to fatten an ox of three or four years old, when perfectly lean, in the courſe of three months. They are given in the proportion of about thirty pounds weight, morning, noon, and night; the large ones being ſlit in three or four pieces, and a little hay ſupplied in the intervals of theſe periods.

When given to milch-cows with a little hay in the winter ſeaſon, the butter is found to be of as fine a colour and as excellent a flavour as when feeding in the beſt paſtures †. Indeed, the reſult of experiment has ſhewn, that not only in neat cattle, but in the fattening of hogs and poultry, the animals become fat much ſooner, and are more bulky, than when fed with any other root or vegetable. Beſides, the meat is more ſweet and delicate ‡.

* Communications to the Board of Agriculture, vol. I. † Ibid.
‡ Ibid.

When chopped and uſed with dry cut meat, horſes are alſo ſaid to eat them freely and thrive well upon them.

But, beſides the root, the tops afford much green food for cattle and hogs, either after being cut off when taken up, or when conſumed in the field. In the latter method the proper time of turning the animals upon them is when they firſt begin to ſhrink and grow dry *.

In order to preſerve them for ſpring uſe, they may be dug up, in the ſame manner as carrots, in the cloſe of the autumn, and be packed up in the ſame way.

As this root is capable of being grown to advantage on ſoils that are too heavy for the carrot, and poſſeſſes equal, if not ſuperior, properties for the feeding and fattening of various kinds of animals, it would ſeem to require more attention than has hitherto been beſtowed upon it by cultivators.

Mangle Wurzel.—This is another of the tap-rooted kind of plants that has been introduced into field culture †. It is probably a variety of the common beet. The plants grow to a large ſize, both in their roots and tops, the former being of a whitiſh red colour. The leaves in the latter are of an oblong ſhape, extremely thick, fleſhy, and ſucculent. They are ſaid to be equal in quality to Spinach, and, from their frequently extending in length more than thirty inches, and in breadth above twenty, to greatly exceed that vegetable in point of produce.

This, like all the other tap-rooted plants that have been employed for the purpoſes of huſbandry, thrives beſt in the deep, friable, ſandy, or light loamy kinds of ſoil.

In preparing the ground, it is neceſſary to render it as deep and fine as poſſible in the mold. This may be beſt effected in the heavier ſorts of land, by means of trench ploughing, in the manner that has been recommended for the parſnip; and in thoſe of the lighter kinds by repeated common deep ploughing. In both caſes the frequent uſe of the harrow will likewiſe be requiſite. A proportion of good manure ſhould alſo be turned in, ſo as to render the ground ſufficiently rich for the perfect growth of the plants. After this, at the time of putting in the ſeed, the land ſhould be thrown into two-bout ridges, which leaves the tops about two feet in breadth and the furrows one. In this way a conſiderable increaſe in the depth of mold is provided for the

* Communications to the Board of Agriculture, vol. I.

† *Beta major.*

roots of the plants. And in ſoils that are in ſome meaſure retentive of moiſture, the lands are kept by it much drier and in a ſtate more fit for the growth of the plants.

Seed, and time of ſowing.—The ſeed ſhould be carefully ſelected from ſuch plants as are the moſt perfect of their kind, and that have been cultivated at a diſtance from other ſorts. It ſhould have arrived at a full ſtate of ripeneſs, and be made uſe of while freſh. The proper time for putting the ſeed into the ground, in the common method of ſowing, is in the early part of the ſpring, as ſoon as the ſeaſon will admit, as in the beginning or middle of April; but where the tranſplanting method is intended, it ſhould be ſown much earlier, and very thinly, as the beginning of March, in order that the plants may be in a ſtate to ſet out early.

Method of ſowing.—The moſt common method, where the ſurface of the land is flat, is to ſow thinly over the ground, in the manner that is practiſed for carrots, covering the ſeed in by means of very light harrowing. In this way the plants are afterwards ſet out by the hoe. But where the land is raiſed into ridges, in the manner juſt deſcribed, another mode is practiſed; the ſeed is dropped ſingly by the hand into little holes made by a dibble to the depth of about half an inch all along the middle of them, at the diſtance of eight or nine inches from each other, the plants thus ſtanding at the diſtance of three feet from row to row, and eight or nine apart in them. But as it is not neceſſary that they ſhould ſtand nearer than ſixteen or eighteen inches, every other plant may be removed, and uſed for filling up the vacancies where they occur, or if not wanted in that way, wholly removed by the hoe. In this mode the intervals can be kept perfectly clean by the plough or horſe-hoe, and the rows by hand-hoeing.

Where the practice of tranſplanting is adopted, the plants ſhould be removed when not more than three or four inches in length, and be planted in rows upon ridges prepared as above, at the diſtance of eighteen inches each way. In performing the work the holes ſhould be made ſufficiently deep to admit the roots without their being bent. The tops of the plants may be taken off before planting; but the roots ſhould not be touched, nor ſhould they be put in too deep. A rather moiſt ſeaſon ſhould be choſen, if poſſible, for this buſineſs. But though the plants grow well in this method, the roots ſeldom become ſo large as when they have remained in their original ſituation.

After-Culture.—All that is neceſſary in this crop is to ſet out the plants to proper diſtances, where put in in the firſt methods, and keep them clear and free from weeds by one or more hoeings, according to the manner of ſowing that may have been practiſed.

The application of this vegetable has been chiefly in the feeding of neat cattle and hogs; in which both the tops and roots have been employed, but without that ſucceſs which might have been expected from the manner in which it was brought to the notice of cultivators. It is probable that, upon the whole, the root has neither been found to be equal in quality as a cattle food, nor to afford the quantity of produce, that was ſuppoſed on its firſt introduction; but, from its being of a hardy nature, and not liable to be injured either by inſects or the effects of drought, as well as from its leaves being capable of being repeatedly cut over *, it may be occaſionally cultivated in ſituations where green food is much wanted in the latter end of the year for milch-cows, or other ſorts of live ſtock. In ſome trials the plants ſeem, however, to have afforded a large produce in leaves, when gathered every two or three days from July till late in September †. Others have not found the whole produce in leaves and roots equal to that of the large cabbage on the ſame kinds of ſoil, while the culture was conſiderably more troubleſome and expenſive, and the crop not ſo uſeful for the purpoſe of winter conſumption ‡.

In the trials of an ingenious cultivator, the tops were found to be eat with much greedineſs by cows, calves, and hogs, when cut green, during the latter part of the ſummer and in autumn; but the roots were almoſt wholly rejected at theſe periods, though in winter, after they had been taken up, they were eaten very well ‖.

The roots frequently riſe to the weight of from five to eight or ten pounds, according to the goodneſs of the land, and may be preſerved in the winter by being taken up and packed in the manner that has been recommended for carrots.

The chief objections to this vegetable as a field plant are, the great expence of its culture, its being liable to degenerate, and the fibrous nature of the roots rendering their preparation as cattle food troubleſome.

* Where this practice is adopted, the roots will probably ſeldom riſe to any great ſize.

† Annals of Agriculture, vols. XI. and XII. ‡ Ibid. vol. XI. p. 53.

‖ Wimpey, in Bath Papers.

Plantation Crops.—Beſides the various kinds of crops that have been already deſcribed, and which ſerve either for the purpoſe of human or cattle food, there are ſeveral others which are not applicable in theſe ways, but which are extenſively cultivated in different places, in order to be converted into different ſorts of manufactures, or for their application in the arts of brewing, dyeing, &c. Theſe, as they require particular modes of culture, and are frequently grown on the ſame ſpots of ground for a conſiderable length of time, may with propriety be termed *plantation crops*.

Hemp.—This is a plant of the herbaceous fibrous-rooted kind, which has a thick ſtrong ſtem, that riſes to a conſiderable height, and affords a rind or covering of a firm ſtrong texture, that is valuable for the purpoſe of being manufactured into cloth, cordage, &c.

The ſoils moſt ſuited to the culture of this plant are thoſe of the deep black putrid vegetable kind, that are low and rather inclined to moiſture, and thoſe of the deep, mellow, loamy, or ſandy deſcriptions. The quantity of produce is generally much greater on the former than on the latter; but it is ſaid to be greatly inferior in quality. It may, however, be grown with ſucceſs on lands of a leſs rich and fertile kind, by proper care and attention in their culture and preparation.

In order to render the grounds proper for the reception of the crop, they ſhould be reduced into a fine mellow ſtate of mold, and be perfectly cleared from weeds, by repeated ploughing. When it ſucceeds grain crops, the work is moſtly accompliſhed by three ploughings, and as many harrowings; the firſt being given immediately after the preceding crop is removed, the ſecond early in the ſpring, and the laſt or ſeed earth juſt before the ſeed is to be put in. In the laſt ploughing, well rotted manure, in the proportion of fifteen or twenty, or good compoſt in the quantity of twenty-five or thirty three-horſe-cart loads ſhould be turned into the land, as without this it is ſeldom that good crops can be produced. The ſurface of the ground being left perfectly flat, and as free from furrows as poſſible; as by theſe means the moiſture is more effectually retained, and the growth of the plants more fully promoted.

Seed, and method of ſowing.—It is of much importance in the cultivation of hemp crops that the ſeed be new and of a good quality, which may in ſome meaſure be known by its feeling heavy in the hand, and being of a bright ſhining colour.

The proportion of ſeed that is moſt commonly employed is from two to three buſhels, according to the quality of the land; but as the crops are greatly injured by the plants ſtanding too cloſely together, two buſhels or two buſhels and a half may be a more advantageous quantity.

As the hemp plant is extremely tender in its early growth, care ſhould be taken not to put the ſeed into the ground at ſo early a period as that it may be liable to be injured by the effects of froſt, nor to protract the ſowing to ſo late a ſeaſon as that the quality of the produce may be affected. The beſt ſeaſon, on the drier ſorts of land, in the ſouthern diſtricts, is probably as ſoon as poſſible after the froſts are over in April; and, on the ſame deſcriptions of ſoil, in the more northern ones, towards the cloſe of the ſame month, or early in the enſuing one: but when the ground is more inclined to moiſture, it may be a better practice to delay the ſowing to a later period in both caſes, chooſing, if poſſible, a time when the land is neither too dry nor too moiſt for performing the buſineſs. Sowing as early as poſſible is, however, in general, to be preferred; as where this is the caſe, by the crops becoming more ſtrong and vigorous in the early part of their growth, the hemp is found to withſtand the various operations that are afterwards to be performed upon it in a better manner*.

The moſt general method of putting crops of this ſort into the ſoil is the broadcaſt, the ſeed being diſperſed over the ſurface of the land in as even a manner as poſſible, and afterwards covered in by means of a very light harrowing. It is probable, however, that in many caſes, eſpecially where the crops are to ſtand for ſeed, the drill method in rows at ſmall diſtances might be had recourſe to with advantage; as in this way the early growth of the plants would be more effectually promoted, and the land be kept in a more clean and perfect ſtate of mold, which are circumſtances of importance in ſuch crops. In whatever method the ſeed is put in, care muſt conſtantly be taken to keep the birds from it for ſome time afterwards.

This ſort of crop is frequently cultivated on the ſame piece of ground for a great number of years, without any other kind intervening †; but in ſuch caſes manure muſt be applied with almoſt every crop in pretty large proportions, to prevent the exhauſtion that muſt otherwiſe take place. It may be ſown after

* Modern Agriculture, vol. III.

† Mr. Young in the Agricultural Report of Suffolk has remarked it to have been grown in ſucceſſion for ſeventy years together.

moſt ſorts of grain crops, eſpecially where the land poſſeſſes ſufficient fertility, and is in a proper ſtate of tillage.

After-Culture.—As hemp, from its tall growth and thick foliage, ſoon covers the ſurface of the land, and prevents the riſing of weeds, little attention is neceſſary after the ſeed has been put into the ground, eſpecially where the broadcaſt method of ſowing is practiſed; but when put in by the drill machine, a hoeing or two may be had recouſe to with advantage in the early growth of the crop.

In the culture of this plant it is particularly neceſſary that the ſame piece of land contains both *male*, and *female*, or what is ſometimes denominated *fimble*, hemp. The latter kind contains the ſeed.

When the crop is ripe,—which is known by its becoming of a whitiſh yellow colour and a few of the leaves beginning to drop from the ſtems, and is commonly about thirteen or fourteen weeks from the period of its being ſown, according as the ſeaſon may be dry or wet, the firſt ſort being moſtly ripe ſome weeks before the latter,—the next operation is that of taking it from the ground, which is effected by pulling it up by the roots in ſmall parcels at a time, by the hand, taking care to ſhake off the mold well from them before the handfuls are laid down. In ſome diſtricts the whole crop is pulled together, without any diſtinction being made between the different kinds of hemp; while in others it is the practice to ſeparate and pull them at different times, according to their ripeneſs *. The latter is obviouſly the better practice; as by pulling a large proportion of the crop before it is in a proper ſtate of maturity, the quantity of produce muſt not only be conſiderably leſſened, but its quality greatly injured, by being rendered leſs durable †. The expence of this operation varies conſiderably in different diſtricts; in ſome it amounts to eighteen or twenty ſhillings, while in others it is equally well performed for eleven or twelve. After being thus pulled it is tied up in ſmall parcels, or what are ſometimes provincially termed *baits*.

But where crops of this kind are intended for ſeeding, they ſhould be ſuffered to ſtand till the ſeed becomes in a perfect ſtate of maturity, which is eaſily known by the appearance of it on inſpection. The ſtems are then pulled and bound up as in the other caſe, the bundles being ſet up in the ſame manner as grain, until the ſeed becomes ſo dry and firm as to ſhed freely; it is then either

* Corrected Report of Suffolk. † Modern Agriculture, vol. III.

immediately threſhed out upon large cloths for the purpoſe in the field, or taken home to have the operation afterwards performed.

The after-management of hemp crops varies greatly in different places where their culture is encouraged; in ſome it is the practice to only what is called *dew ripen* or *ret* the produce, while in others the general cuſtom is to *water ret* it.

In the former method, the hemp, immediately after being pulled, is carefully ſpread out in a very even, regular, and thin manner, on a piece of level old paſture, on which it is to remain for five, ſix, or more weeks, according to circumſtances, being occaſionally turned during the time. When the weather is ſhowery, this is moſtly done three times in the week; but in other caſes twice is commonly ſufficient. When the rind or hempy ſubſtance becomes eaſily ſeparable from the woody part or ſtem, it is taken up and tied into bundles, either to be ſtacked up on the ſpot, or carried home and placed in ſome convenient ſituation, where it may remain until it can be manufactured. In this proceſs, which is termed *graſſing*, great attention is requiſite to prevent the texture of the hemp from being injured by its remaining too long on the graſs.

But the latter practice is much better and more expeditious, as well as more general. In this the hemp, as ſoon as pulled, is tied up in ſmall bundles, frequently at both ends. It is then conveyed to pits or ponds of ſtagnant water about ſix or eight feet in depth, ſuch as have a clayey ſoil being in general preferred *, and depoſited in *beds*, according to their ſize and depth; the ſmall bundles being laid in both a ſtraight direction and croſſwiſe of each other, ſo as to bind perfectly together; the whole being loaded with timber or other material, ſo as to keep the beds of hemp juſt below the ſurface of the water: the quantity of an acre, or three ſmall waggon-loads, being in ſome inſtances piled in one bed; but as the action of the atmoſpheric air is eſſentially neceſſary to produce that degree of putrefaction which is requiſite for deſtroying the ſmall fibres and vegetable gluten by which the bark or hempy ſubſtance adheres to the *bun* or ſtem, it may be more advantageous to build them in much ſmaller beds; as by ſuch means the buſineſs may not only be more expeditiouſly accompliſhed, but the danger of rotting the hemp too much prevented. And on the ſame principle the depth of the ponds ſhould not exceed the dimenſions given above. It is not uſual to water more than four or five times in the ſame pit,

* Corrected Report of Suffolk.

till it has been filled with freſh water *. Where the ponds are not ſufficiently large to contain the whole of the produce at once, it is the practice to pull the hemp only as it can be admitted into them, it being thought diſadvantageous to leave the hemp upon the ground after being pulled. It is left in theſe pits four, five, or ſix days, or even more, according to the warmth of the ſeaſon, and the judgment of the operator, on his examining whether the hempy material readily ſeparates from the reed or ſtem; and then taken up and conveyed to a paſture field which is clean and even, the bundles being looſed and ſpread out thinly ſtem by ſtem, turning it every ſecond or third day, eſpecially in damp weather, to prevent its being injured by worms or other inſects. It ſhould remain in this ſituation for two, three, four, or more weeks, according to circumſtances, and be then collected together when in a perfectly dry ſtate, tied up into large bundles, and placed in ſome ſecure building until an opportunity is afforded for breaking it in order to ſeparate the hemp. By this means the proceſs of *graſſing* is not only ſhortened, but the more expenſive ones of breaking, ſcutching, and bleaching the yarn, rendered leſs violent and troubleſome. Beſides, the hemp managed in this way ſells much dearer than that in the former method. After the hemp has been removed from the field, and the buſineſs of *graſſing* properly performed, it is in a ſtate to be broken and ſwingled; operations that are moſtly performed by common labourers, by means of machinery for the purpoſe, the produce being tied up in ſtones. The refuſe collected in the latter proceſſes is denominated *ſheaves*, and is in ſome diſtricts employed for the purpoſes of fuel, being ſold at two pence the ſtone †. After having undergone theſe different operations, it is ready for the purpoſes of the manufacturer.

The produce of hemp crops is extremely variable and uncertain. In Suffolk it ſometimes riſes to forty-five and fifty, or even more, ſtones on the acre; but in other caſes it does not much exceed half theſe quantities. The average of crops of this ſort, when made ready for the *heckle*, is ſtated by a late writer to be from thirty-eight to forty ſtones of fourteen pounds each. The price is generally from about ſeven ſhillings and ſix pence to eight or nine ſhillings the ſtone, excluſive of the bounty allowed by government, which often amounts to fifteen or twenty ſhillings the acre more ‡. When ſold on the ground as the crop ſtands, it generally fetches in Suffolk about one ſhilling the rod, or eight pounds the acre.

* Corrected Report of Suffolk. † Ibid. ‡ Modern Agriculture, vol. III.

In cafes where the hemp ſtands for ſeed, the moſt common proportion is from about eleven to twelve buſhels on the acre, the price being from four or five to ſix ſhillings the buſhel.

The expences of cultivating and managing the different operations in crops of the hemp kind, from their requiring the beſt ſorts of ſoil, much manure, and great attention and trouble, muſt of neceſſity be conſiderable. From the ſtatements of the able writer of the Survey of the County of Suffolk, they however appear highly beneficial to the cultivator. They are as below *; but it is obvious that they muſt be liable to vary greatly according to circumſtances.

* At Hoxne the expences and profit were found to ſtand thus:

EXPENCES.

	£.	s.	d.
Rent, tythe, and rates	1	10	0
Manure, 25 loads, at 1s. 6d.	1	17	6
Three earths, at 4d., harrowing included	0	12	0
Seed	0	16	6
Sowing	0	0	6
Pulling	0	12	10
Watering	0	12	0
Graſſing	0	10	0
Breaking	2	12	6
Carriage and delivery	0	5	0
	£. 9	8	10

PRODUCE.

Forty-five ſtone, at 7s. 6d.	£. 16	17	6
Expences	9	8	10
Profit	£. 7	8	8

But at Beccles, where a very different mode of calculation takes place, and rent is *valued*, they were theſe:

EXPENCES.

	£.	s.	d.
Rent, tythe, and rates	4	0	0
Manure	3	0	0
Tillage	1	4	0
Seed, twelve pecks	1	16	0
Pulling	0	19	0
Watering	0	12	0
Graſſing	0	10	0
Breaking	2	10	0
	£. 14	11	0

PRODUCE.

Though the profit on hemp may appear conſiderable in theſe eſtimates, its cultivation has not increaſed in any very rapid manner; which is probably owing to its requiring a larger proportion of manure than can commonly be ſpared from the other ſorts of crops, as well as its demanding a great and conſtant attention through the whole of its management, which frequently interferes with the other operations of the farmer. In diſtricts where its culture is the moſt extended, it would ſeem, however, to be of great utility and advantage to the poor, by affording them much employment in the different proceſſes and manipulations through which it is neceſſary for it to paſs before it becomes in a ſtate fit for the manufacturer.

When hemp crops ſtand for the purpoſe of procuring the ſeed, they ſhould remain upon the ground till perfectly ripe; when, after being pulled, the produce ſhould be placed thinly upon its root end againſt a wall, paling, or other convenient ſituation, according to the ſtate of the weather, until it becomes quite dry: the top parts containing the ſeed are then cut off, the ſeed being threſhed out immediately and cleaned; as when it is ſuffered to remain any length of time in its moiſt uncleaned ſtate, its colour is liable to be much injured, and the ſubſtance ſo much impaired as not only to be improper for the purpoſe of ſowing, but on being cruſhed for oil to afford a leſs quantity, and ſuch as is of an inferior quality *. The buns or ſtems of the hemp may afterwards either be put into the pond to be *watered*, or *dew retted* in the manner deſcribed above: the former practice is, however, in general to be preferred; as where the latter is adopted the hempy ſubſtance ſeldom becomes of ſo good a colour †.

According to a late writer, the moſt advantageous period for the farmer to diſpoſe of hemp crops, is while they remain upon the ground, juſt before the ſeaſon of pulling them; as by this means he avoids the trouble and uncertain expence of the different operations which are requiſite in its preparation for the market, and which are ſo liable to interrupt his other buſineſs. In cheap populous diſtricts, where the ſoil is ſuitable, and there is a large extent of graſs or other ſorts of green crops in proportion to the arable, hemp crops may probably be intro-

PRODUCE.

Fifty ſtone, at 8*s.*	£.	20	0 0
Expences		14	11 0
Profit	£.	5	9 0

* Farmer's Magazine, vol. I.

† Corrected Report of Suffolk.

duced and cultivated to great profit by the attentive farmer; but while the demand for grain continues ſo great, it is not very likely that its culture ſhould become extenſive in other ſituations.

As hemp, from its growing to a great height and being very ſhady in the leaf, leaves the land in a perfectly clean condition, it may, where the ſoils are proper, be an excellent preparation for wheat crops; and where they are too light for that ſort of grain, barley or turnips may be had recourſe to with advantage.

The hemp produced in this kingdom is in general conſidered as ſuperior to that imported from abroad, and of courſe more proper for being converted into the various finer ſorts of cloths and cordage.

Flax.—This is another plant of the fibrous-rooted kind cultivated in the field for the purpoſe of the cortical ſubſtance covering the ſtem, and the ſeed. It is the common flax plant * that is employed in this culture, which riſes in ſtem to the height of from two to three feet.

The ſoils moſt ſuitable for crops of this ſort are thoſe of the more deep and friable loamy kinds, and ſuch as contain a large proportion of vegetable mold in their compoſition. On ſtrong loamy clays that have been well broken down and reduced by tillage, they have alſo been found to anſwer well. The ſandy or very light gravelly lands are ſeldom found to ſucceed well with flax crops. But whatever the nature of the ſoil may be, it ſhould neither contain too large a proportion of moiſture, nor be too dry; but have the mold in a fine and well-pulveriſed condition. Such lands as are ſituated rather low, as upon the banks of rivers, are found by cultivators to be well adapted to the growth of flax. It has indeed been contended by ſome, that where the ſoil contains water at no great depth below the ſurface, it is the moſt beneficial for the growth of this crop; as in thoſe parts of Holland and the Low-countries where it is grown in the greateſt perfection, the ground is always found to be deep, and rather inclined to ſtiffneſs and the retention of moiſture at ſome depth below the ſurface. The lands for this crop ſhould neither be in too rich nor too poor a condition: as when the former is the caſe the flax is apt to grow too luxuriantly and of courſe to produce a *coarſe* ſort; and on the contrary, where they are in the latter ſituation, the plant by growing weakly affords only a ſmall produce.

In the preparation of the land, as it is neceſſary that it ſhould be made perfectly

* *Linum uſitatiſſimum.*

fine in the mold, it muſt be repeatedly ploughed over, and broken down by harrowing. When the land is to be broken up from the ſtate of ſward, the firſt ploughing ſhould be given late in the autumn, and be left in that condition till the beginning of the ſucceeding year; when it ſhould be well reduced by harrowing with a pretty heavy harrow, and afterwards, in the courſe of a week or two, ploughed over a ſecond time, in which ſituation it may be left till the period of putting in the ſeed, when it ought to be again harrowed over by a lighter harrow, and ploughed with a very light furrow: but where flax is ſown after grain or other ſorts of crops that keep the land in a clean ſtate, the firſt ploughing need not be given until the beginning of the year, in which ſtate it may remain till it becomes tolerably dry in the early ſpring, when it muſt be well broken down by harrowing and rolling, and after it has continued in that ſituation for eight or ten days or more, according to circumſtances, the land will be ready for the ſeed, or, if not perfectly fine, another light ploughing and harrowing may be given previous to the putting in of the ſeed.

Flax crops are cultivated after moſt ſorts of grain, as wheat, rye, and oats, as well as after different kinds of green crops, as turnips, potatoes, and ſeveral others; but when put in after the latter the flax in general ſuceeeds the beſt.

Seed.—That which is freſh and ſufficiently ripened ſhould conſtantly be preferred; which is known by its being more bright and ſhining in its colour, more oily in the feel, and more weighty in the hand. Seed of home produce is ſometimes made uſe of for ſowing; but more generally that which is imported from other countries, as Holland, the Baltic, and America; that brought from the firſt is, however, moſtly held in the higheſt eſtimation, from its quality of ripening more early than the others, and affording a more abundant produce of that ſort of flax which is moſt uſeful in the different manufactures; that brought from the Baltic is ſuppoſed to produce a coarſer ſort of flax, but a larger proportion of ſeed, than any of the other kinds. The American ſeed yields in general a flax ſufficiently fine; but the ſeed-pods being ſmall, there is not ſo large a quantity of ſeed obtained from it. In Yorkſhire they frequently ſow the ſeed of home produce for white flax; but where ſeed is intended to be taken, the Baltic ſort is preferred, which, for the ſucceeding and a year or two afterwards, is found to anſwer well as white flax. And in the northern parts of the kingdom it is often a practice to ſow ſeed obtained from the crop of the preceding year, eſpecially where it was raiſed from imported ſeed. It is ſuppoſed by the cultivators of this ſort of crop, that their ſucceſs in raiſing it depends greatly on the ſeed

being frequently changed, and such as is imported from abroad being made use of. It is probable, however, that if that selected from the finest and most perfectly ripened seed of our own growth was employed, it would be equally productive both in the flaxy substance and the quantity of seed, and at the same time afford the former of an equally good quality for all the purposes of the manufacturer. In Ireland they prefer the American seed for their lighter and more elevated grounds, and the Dutch or Baltic for those of the more heavy kind *.

Quantity of seed.—The proportion of seed is variable according to the circumstances of the soil, the uses to which the produce is to be applied, and the method of sowing that is practised; but in general from two bushels to two and a half may be considered as sufficient for the acre, when sown in the broadcast manner. It should never be sown very thick, except where the flax is required to be very fine in quality. For, when the seed is sown too thick, the plants, from being so close together, are liable to be drawn up to a great height and become weak, consequently to fall down upon the ground in case of much wet weather, and the produce be thereby greatly injured in its colour and other properties. But in the drill mode of sowing, a much less proportion of seed will be found sufficient. If the distance of the rows be eighteen or twenty inches, less than one half of the above quantity will answer the purposes of the cultivator.

In short, where the crop is intended to stand for seed, in whatever manner the sowing is performed, a much less proportion of seed should be employed than where the flax is the chief object.

Time and method of sowing.—The period of putting flax crops into the ground is different, according to the situation and nature of the soil; but from the beginning of March to the middle of April may in general be considered as the most proper season. In Yorkshire, when this crop is cultivated upon land broken up from the state of grass, the seed is mostly sown before the second week in April, if the weather will admit of it †; and on such lands as have been in the state of tillage, the period of sowing is seldom protracted more than a week or ten days longer. Early sowing, where it can be safely adopted, has the advantage of enabling the flax plants to cover the ground well before

* Martyn's Edition of Miller's Dictionary, art. *linum*.

† Corrected Report of West Riding, Yorkshire.

they can ſuſtain much injury from thoſe of the weed kind, or from the effects of the dry hot ſummer ſeaſon.

The broadcaſt method of ſowing is that which is the moſt generally employed in putting crops of this ſort into the ground, eſpecially where they are intended only for the purpoſe of flax; but where the ſeed is the chief object, they are ſometimes put in in the drill method: and it is contended by ſome that in this way better ſeed may be produced, than by the former mode; as where the ſeed is ſown thickly the plants run up more in height, and produce a flaxy ſubſtance which is of an extremely fine and ſoft quality; but the ſeed, from the weakneſs of the plants, is ſmall in the grain, and not large in quantity; while, on the contrary, when ſown thinly, the ſtems of the plants, not riſing ſo high, are more ſtrong and vigorous, ſending off more numerous branches towards the top, by which not only a greater abundance of ſeed is afforded, but ſuch as is much better filled, and more plump and heavy.

In ſowing the crop in the firſt method, much care is neceſſary in the ſeedſman to diſtribute the ſeed over the ſurface of the land in as regular and uniform a manner as poſſible, as without this care the crop will ſuſtain great injury by coming up too cloſely together and in tufts. It is afterwards to be harrowed in by one or two light harrowings in a place; or, where the ſurface of the ground has been rendered very fine and even, a buſh-harrow may anſwer the purpoſe equally well. The ſeed ſhould not in either way be covered in too deeply, as the quick vegetation of the crop may by ſuch means be too much retarded.

Where the drill is employed, the diſtances of the rows may vary according to the circumſtances of the ſoil, or the intentions of the cultivator; but when the crop is to be kept clean by the hand-hoe, ſmall intervals, as twelve inches, are moſtly recommended; but where horſe-hoes or cultivators are to be made uſe of, intervals of eighteen or twenty inches, or perhaps more, may be proper, care being taken that the machine does not depoſit the ſeed to too great a depth in the ſoil. After the operation has been performed, a buſh-harrow, or light harrow of the common kind, may be once paſſed over the ſurface juſt to render it even. When the ſoil is of a dry kind, and the ſeaſon is inclined to be dry, in either method of ſowing it may be adviſeable to paſs a light roller over the ground immediately after the ſeed has been put in, in order that the moiſture may be more effectually preſerved.

After-Culture.—Although it is ſeldom the practice of the cultivators of flax crops to weed them, eſpecially when ſown in the broadcaſt method, yet as the

plants are extremely tender in their early growth, and of courſe liable to be much injured and retarded in their vegetation by the riſing of weeds, a hand-hoeing or weeding ſhould conſtantly be given them, as ſoon as the plants are fully come up and ſhew themſelves. This is particularly neceſſary where proper attention has not been beſtowed in cleaning and preparing the ground by repeated ploughing, harrowing, and carrying off or burning the weedy materials. In performing the buſineſs of weeding, great care ſhould be taken that no injury be done by cutting up or treading under foot the flax plants. It is perhaps only by keeping the land perfectly clean and free from weeds in this way, during the early growth of the plants, that good crops of this kind can be produced.

It is recommended that this operation ſhould be performed as ſoon as the flax plants have advanced three or four inches in height, the weeds that are drawn out being carefully picked up and conveyed from the land*. By having the ſoil well prepared before the ſeed is put in, much expence in this way may, however, be avoided.

In the drill method of ſowing, where narrow intervals are preferred, the crop is moſtly kept clean by the uſe of the hand-hoe; but where the diſtances of the rows are larger a ſmall plough, the horſe-hoe, or what is termed a cultivator, may be made uſe of in order to preſerve the land in a perfectly clean condition. A ſort of triangular harrow has alſo been found to be a very convenient tool for this purpoſe. From its having handles behind, it is capable of being guided with facility, and at the ſame time made to paſs deeper or ſhallower, according to circumſtances, without the danger of raiſing the mold againſt the rows of the plants. In this way the buſineſs may be accompliſhed by one horſe at but little expence, much ground being gone over in a ſmall ſpace of time. In theſe caſes, however, the rows muſt be cleaned by means of hand-weeding, which is accompliſhed with much leſs difficulty and harm to the crops, from the room that is afforded by the intervals.

No other ſort of plant ſhould ever be grown with that of flax, though ſuch methods may have been in ſome inſtances practiſed, as the crops in ſuch caſes muſt always be in danger of being greatly injured.

The young flax plants are ſometimes liable to be deſtroyed or greatly injured in their growth by the attacks of inſects; where this is the caſe, it has been found uſeful to ſow ſoot or wood aſhes thinly over the crops, as from the ve-

* Modern Agriculture, vol. III.

getation of the plants being in this way promoted, they become improper for the food of ſuch animals.

As crops of this kind, from the tallneſs of their growth, are apt to fall down and lodge upon the ground, by which the flaxy ſubſtance is liable to be injured in its colour and other properties, it has been propoſed to ſupport and keep them up by means of long ſlender poles, or ſmall cords, paſſed in different directions of the ground, and fixed at the angles by ſtakes. Theſe methods are, however, troubleſome; and where the crops are not ſown too thick, will ſeldom or ever be neceſſary.

The cultivators of flax crops are not yet fully decided in reſpect to the degree of ripeneſs at which they may be pulled with the greateſt benefit; ſome contending that it ought to be done before the greenneſs of the ſtems wholly diſappears, in order that the fibres of the flax may be finer and have a greater degree of ſoftneſs. Others with ſimilar intentions maintain, that it ſhould be pulled before the ſeeds are perfectly formed; while others again inſiſt that the operation ſhould not be performed until ſome of the capſules containing the ſeed begin to open, aſſerting that the fibres of green flax are not only tender but run too much to tow. But, notwithſtanding this, experience has ſhewn that the fibres of over-ripened flax are conſtantly harſh, and poſſeſs too great a degree of ſtiffneſs; and beſides, ſeparate from the reed with more difficulty, and are more tedious in the operation of bleaching. Hence it would ſeem that both extremes ought to be carefully avoided, and that the moſt proper period for accompliſhing the buſineſs is immediately on the ſtem or reed beginning to change from a green to a yellowiſh caſt, and the lower leaves to fall off, the ſeed aſſuming a brownish colour.

Where the ſeed is the principal object of the grower, the crop ſhould, however, be ſuffered to remain upon the ground until it becomes perfectly ripened, which is eaſily known by the ſeed-pods turning hard and ſharp in the points, and the capſules beginning to crack and open. This generally happens towards the latter end of July or beginning of Auguſt.

In pulling, the flax is laid in ſmall parcels or *beats* upon the ſurface of the ground, in ſuch a poſition as that it may have the full benefit of the ſun. It is then to be tied up, and conveyed as ſoon as poſſible to the place of watering. As where this ſort of crop is cultivated upon a large ſcale, from the great differences in the ſoil and other cauſes, there will be conſiderable variations in the quality of the flax, ſome being fine, others coarſe; ſome long, and others ſhort;

care ſhould be taken at the time of pulling to ſeparate and put the different ſorts together; as by this means the injuries ſuſtained by ſubjecting flax of ſuch different qualities to the ſame operations and proceſſes, may be avoided. It has been remarked by an intelligent writer, that inattention in flax cultivators to this neceſſary precaution, is the chief cauſe why crops of this kind often turn out of ſo little value, and the principal reaſon of the ſmallneſs of the proportion of ſuch flax as is of a good quality in compariſon with that of the tow or inferior ſort; the different manufacturers, in the courſe of their operations, being under the neceſſity, on account of the mixed condition in which they receive it from the cultivators, to reduce the quality of the whole to a much lower degree than would be requiſite if the different kinds were ſorted at the time of pulling the crops, and delivered under ſuch circumſtances *.

When the ſeed is intended to be ſaved, it is the uſual practice in pulling the crop to place the handfuls partly acroſs each other, as by this means the buſineſs of *rippling* is greatly facilitated, the operators not having the trouble of ſeparating them from the large bundles.

The operation of *rippling* ſhould be performed as ſoon as poſſible after the crops have been pulled. This is accompliſhed by means of a ſort of iron comb with ſtrong triangular teeth of conſiderable length, ſet upright, pretty cloſely together, and fixed upon a ſtrong flat piece of wood, ſo as that the operators can ſit at each end, and by frequently ſtriking the ſeed-end of the flax upon it, and pulling it through with rapidity, the ſeed-pods are forced off with much expedition, and in a very perfect manner. Where the ſeed thus obtained is intended to be preſerved, a large cloth ſhould be ſpread out previouſly in ſome convenient ſituation for the purpoſe of receiving it from the ripple, and it ſhould be immediately afterwards ſpread out thinly, and expoſed to the ſun, till the capſules containing it become perfectly criſp and dry; they are then to be broken and the ſeed ſeparated from them by lightly threſhing or treading upon them; the whole of which being afterwards well cleaned by winnowing and ſifting, and laid up in a dry room. And when a large quantity is put together, it ſhould at firſt be frequently turned over in order to prevent its being injured by heating. The ſeed which is procured from ſuch crops as are intended for flax, and which have not ſtood till it is perfectly ripened, may be collected and ſold for the purpoſe of having the oil expreſſed from it; but it is improper for uſe as ſeed.

Some experienced cultivators of flax, when grown for the ſeed, ſet up the

* Donaldſon's Preſent State of Agriculture, vol. III.

produce, when tied into ſheaves, in the manner of grain, and when it is become perfectly dry, have it ſtacked up until the enſuing ſpring, when, by placing the tops of the ſheaves towards each other, and making uſe of a roller, the ſeed is eaſily forced out. In this way more time is ſuppoſed to be allowed for the after-management *. In moſt diſtricts where much attention is beſtowed, it is likewiſe the practice, even when the crops are only cultivated for the purpoſe of the flax, to ripple off the ſeed-pods before the buſineſs of watering is commenced; as it is found from experience, that when it is put into the water without this having been done, the water, from its quickly becoming putrid, is liable to do much injury to the flax.

The ſtem parts are tied up into ſmall parcels containing two or three handfuls, in a rather looſe manner, in order to their being carried to the pond for the purpoſe of *watering*, which is the next operation that becomes neceſſary.

The intention of this proceſs is that of inducing a ſlight degree of putrefaction, by which the ſubſtance that unites the flaxy material to the ſtem or reed is deſtroyed, and the flax of courſe rendered eaſily ſeparable. In this crop, as in that of hemp, there are two methods practiſed for the purpoſe of accompliſhing the buſineſs; one of which is by immerſing it in ponds of ſtagnant water for ſome time, and the other by expoſing it to the influence of the atmoſphere till the ſame circumſtance takes place. The former is the moſt general practice, and commonly eſteemed more certain as well as more ſafe from injuring the flax; the exact point of putrefaction that is requiſite not being ſo eaſily aſcertained in the latter method. Whichever practice is adopted, the length of time which is required for accompliſhing the purpoſe, depends conſiderably upon the ſtate of ripeneſs at which the crops have been pulled, the quality and temperature of the water in which it is placed, and the moiſture or dryneſs and warmth of the ſeaſon in which it is expoſed.

In *water retting* the flax, ponds of ſtagnant ſoft clear water are conſtantly preferred, as being found much ſuperior to thoſe of other kinds. The greater the degree of warmth the water has attained before the flax is immerſed in it, the ſooner the proceſs is effected, the heat of the water greatly promoting the perfect ſeparation of the harl or flaxy material from the reed. The rule for judging when the flax has undergone a ſufficient degree of maceration in the water, is that of the cuticle or ſkin readily peeling off from the bun or ſtalk the whole length; the latter breaking as if rotten, and appearing of a deep yellow colour.

* Perth Corrected Report.

The manner of depoſiting the flax in the water is much the ſame as that already deſcribed for hemp: in ſome caſes, however, inſtead of the ſmall bundles of flax being placed croſſways over each other, they are ſet in an erect poſition, the tops of every layer except the loweſt being upwards. And inſtead of keeping the whole down below the ſurface of the water by ſtones, wood, or other heavy materials, earth is made uſe of, to the depth of a few inches, and men employed to tread the whole down occaſionally once or twice a-day at firſt, ſo as to keep it from riſing above the ſurface; as when that happens, the flax becomes black and the ſale is injured *. The firſt ſeems, however, the moſt ſimple and eaſy method.

After having thus remained in the water a proper length of time, as five, ſix, or more, days, according to the particular circumſtances of the caſe, the flax is taken from the pits by means of drags, and laid on the ſides perfectly ſtraight for a few hours, in order that it may become ſomewhat dry; it is then removed to a paſture or graſs field that has been lately mown, where it is to be ſpread out thinly in rows in as even and regular a manner as poſſible, each row overlapping the other a few inches, in order the better to prevent their being diſturbed by the wind. When left in lumps and not ſpread evenly, the flax is liable to become green, and never afterwards to be capable of being made a good colour.

After having remained in this ſituation for a few days, it ſhould be turned, which is beſt done after a ſhower or two of rain. When the colour is become perfectly bright and even, and the cuticle or ſkin begins to riſe, bliſter, and ſeparate from the ſtem or reed, it is ready to be taken up. For this buſineſs a fine dry day ſhould be choſen, if poſſible; and the flax, after being bound into pretty large bundles, may either be ſtacked up for uſe afterwards, or be immediately broken and ſcutched in the manner already adviſed for hemp.

In the ſecond or *dew retting* method, which is much practiſed in ſome of the ſouthern diſtricts of the kingdom, as in Dorſetſhire, the flax, immediately after being pulled, is ſpread out in rows thinly upon a graſs field, where it is occaſionally turned until the proceſs of putrefaction has, in a more ſlow and gradual manner than in the above practice, effected the condition which is neceſſary for the eaſy and perfect ſeparation of the flaxy material from the reed or ſtem. But in this mode there is conſiderably more danger, from the flax being under the neceſſity of remaining a much greater length of time expoſed to the action and effects of the weather and other cauſes. But in whichever method the flaxy

* Corrected Report of the Weſt Riding of Yorkſhire.

material is brought into the proper condition for being ſeparated from the reed or ſtem, great care ſhould be taken that it be not damaged by continuing too long upon the graſs, as in many caſes, eſpecially in rainy ſeaſons, the under ſide next the graſs is liable to be rotten or greatly tendered, before the upper one is nearly in a ſuitable ſtate of preparation. The ſuppoſition that expoſure in the field tends to expedite the proceſs of bleaching in the manufactured article is not well founded; in practice no cloth being found to bleach with ſo much expedition, or in ſo uniform a manner, as that made from ſuch flax as has been water-retted in a complete and equal manner*.

Before the buſineſs of *breaking* or *ſcutching* the flax can be performed, which is the next operation that it undergoes, it becomes neceſſary either to expoſe it to the heat of the ſun, by placing it againſt a wall or paling in a ſlanting poſition; or the effects of fire, by putting it over hurdles, or, what is much better, placing it in an oven heated by means of the refuſe of the flax. In either caſe the fire ſhould be applied in ſuch a manner as that the heat may be very moderate. The flax ſhould only be permitted to remain ſuch a length of time as may be juſt ſufficient to remove any damp it may have acquired. In theſe ways the dampneſs is diſpelled in a more equal and ſafe manner than by any other method except that of the ſun, which is always to be preferred when poſſible.

In regard to produce there is ſcarcely any crop that varies more conſiderably than that of flax, either in the quantity or quality of the article. From twenty to ſixty or ſeventy ſtones of fourteen pounds each have been obtained from an acre of land, according to circumſtances; but from forty to fifty ſtones may be reckoned a medium crop. The expence incurred in the cultivation and after-management of this ſort of crop is very conſiderable, ariſing from eight to ten or twelve pounds an acre on the average, where the object of the grower is the flax†. When theſe crops are diſpoſed of before pulling, which is the

* Corrected Agricultural Report of Perth.

† It has been eſtimated by ſome in this way:

	£.	s.	d.
EXPENCES.			
General expences in preparing land, ſowing, &c.	6	0	0
Rent, taxes, tythes, &c.	2	13	4
PRODUCE.			
Forty ſtones at 9s. per ſtone Bounty at 4d. per ſtone	18	13	4
Profit	£. 10	0	0

But

practice of different northern diſtricts where the culture of flax is extenſive, the price is in general from about ſix or ſeven to ten pounds, or upon the average ſomething more than ſeven pounds.

When flax ſeed is the aim of the cultivator, the quantity of that ſort of produce is generally from about ſix to ten or twelve buſhels on the acre. The price depends upon various circumſtances, as the quantity of foreign ſeed that is imported, the demand there is for it for the purpoſes of being expreſſed for its oil, or for being formed into a ſort of jelly as food for fattening cattle. It is moſtly about half the price of that which is imported from Holland for the purpoſe of ſowing. On the average it may probably be eſtimated at from about three or four to five or ſix ſhillings the buſhel.

It ſeems probable from theſe ſtatements, that flax may be grown with great profit and advantage in many ſituations, as in graſs diſtricts, where labourers can be eaſily procured to perform the different operations it requires about the harveſt ſeaſon, where the produce of grain crops more than ſupplies the demands of the inhabitants, and where there are means of providing due ſupplies of manure. But under other circumſtances, as from the fibrous nature of its root, the ſize of its ſtem, the ſmallneſs of its leaf, and the quantity of ſeed which it affords, it cannot but exhauſt and impoveriſh the land without returning any thing in the way of manure, it ſhould perhaps ſeldom be had recourſe to.

But in other calculations the profit is not ſo great. In the Corrected Report of the State of Agriculture in the Weſt Riding of Yorkſhire it ſtands thus:

EXPENCES PER ACRE.	£.	s.	d.
Working the land	0	16	0
Seed	1	1	0
Soding and weeding	0	5	0
Pulling	0	10	0
Leading, diking, &c.	0	10	0
Taking out and ſpreading	0	12	0
Turning and taking up	0	5	0
Rent of land when let to flax-grower	5	5	0
Dreſſing 50 ſtones at 1s. 6d. per ſtone	3	15	0
Profit	7	11	0
	20	10	0
PRODUCE.			
50 ſtones of flax at 8s. 6d. per ſtone	20	10	0

When grown after other crops, thoſe of the turnip and potatoe kind are thoſe that moſt commonly precede it*.

The cakes produced in the proceſs of expreſſing the oil from flax-ſeed are made uſe of for the purpoſe of fattening cattle with great ſucceſs, and in conſequence the price has of late been unuſually high.

A mucilaginous or jelly-like ſubſtance is alſo prepared from flax-ſeed, by means of boiling, or the pouring of water in a boiling ſtate over the ſeed when cruſhed, which is much employed in the fattening of live ſtock.

Hops.—The hop is a plant of the fibrous-rooted perennial kind, which climbs to a conſiderable height, under the ſupport of poles. There is only one ſpecies of this plant in cultivation †, but which has ſeveral varieties, as the *red-bind*, the *green-bind*, the *white-bind*, &c. ‡ It is chiefly grown for the ſake of the bud and flower, which are employed in the brewing of beer and other malt liquors, for the purpoſe of imparting an agreeable bitter to them.

The firſt of the above varieties affords a very ſmall hop; but, from its hardy nature, is capable of being cultivated in expoſed ſituations, and where the climate is cold and not adapted to the other ſorts ‖. It is ſaid to poſſeſs the property of reſiſting the *blaſt* more effectually than any of the other varieties, often appearing healthy and vigorous, in ſeaſons when the other kinds are greatly infeſted with flies and lice §; and at the period of picking to be leſs expoſed to injury from the effects of the ſun or rain than thoſe of other ſorts.

The ſecond or *green-bind*, though leſs hardy than the preceding kind, is conſiderably more productive, and on the middling deſcriptions of land, in ſituations that are not too much expoſed, often ſucceeds very well.

But the third or *white-bind*, which is ſtill more delicate and tender, is the moſt in eſtimation, on account of its being more early, and the produce ſelling at a much higher price. In hops there are alſo male and female plants; but

* It is remarked by the intelligent writer of the Corrected Report of the State of Agriculture in the County of Perth, that in the *law* of Scotland a crop of this ſort is conſidered as a *green crop*, and that of courſe actions brought againſt tenants by proprietors for ſowing flax crops inſtead of thoſe of the ameliorating kind, would be loſt by the latter. It is, therefore, ſuggeſted that this ſhould be guarded againſt by having cloſes in the leaſes ſpecifying in a particular manner the quantity of land to be annually cropped with flax.

† *Humulus lupulus.*

‡ They are likewiſe ſometimes diſtinguiſhed into the *Flemiſh*, the *Canterbury*, the *Goldings*, the *Farnham*, &c.

‖ Modern Agriculture, vol. III.

§ Syopſis of Huſbandry.

the latter only afford the produce for which they are cultivated; the former ſhould of courſe be extirpated as improper and uſeleſs.

It is obvious, that as theſe different varieties muſt of neceſſity ſuit different ſorts of ſoil, and become ripe at very different periods, the planter ſhould be cautious that plants of the different kinds are not ſet out in the ſame plantation; as when this point is wholly neglected, or not ſufficiently attended to, there is much inconvenience experienced in the after-management of the crops, eſpecially where they are large, from the difficulty of procuring a ſufficient number of labourers to proceed with the buſineſs in ſo expeditious a manner as may be requiſite for their ſafety; while by planting the ſeparate ſorts together in a detached manner, the buſineſs of ſecuring and preſerving the produce may be accompliſhed with greater convenience, as the crops become ready at different periods.

The moſt proper ſituations for plantations of this kind are thoſe that have an eaſy, natural, ſloping poſition towards the ſouth, or which are more level, and poſſeſs the advantage of a ſouth-weſterly expoſure, and which are well protected and ſheltered from the effects of the north and north-eaſterly winds, by high grounds, tall fences, or trees of the foreſt kinds, riſing at ſome diſtance from them. But, as the plants grow cloſely together, and riſe to a conſiderable height in the ſtems, they ſhould not by any means be confined, or too much cloſed up in the plantations themſelves, but have the benefit of a full and perfectly free admiſſion and circulation of air, as well as light and the influence of the ſun; as theſe have not only the effect of promoting the vigour and healthy growth of the binds, but, by quickly diſſipating and drying up the ſuperabundant moiſture that may reſt upon them, prevent the crops from being ſo much injured by the *blaſt* or *mildew*. This is fully ſhown by the circumſtance of the middle or more cloſe parts of ſuch crops, eſpecially where they are extenſive, being greatly injured in this way, while the outſide parts, that have the advantage of being more fully expoſed to the air, ſuſtain no injury at all in theſe reſpects.

It has been remarked by a late writer, that ſuch ſituations as are in the immediate vicinity of the ſea, or near marſhy and fenny levels, ſeldom anſwer for the culture of the hop-plant, as they almoſt invariably miſcarry in bad ſeaſons *.

The ſoils moſt adapted to the culture of the hop-plant are thoſe of the more deep, ſtrong kinds, whether of the loamy, clayey, or ſandy qualities. They ſhould be ſuch as incline to dryneſs, without being too deficient of moiſture, and

* Synopſis of Huſbandry.

that have a conſiderable depth of good, rich, vegetable mould. The thin, gravelly, and chalk ſoils are wholly improper for the growth of plants of this nature; the former not being ſufficiently retentive of moiſture for the vigorous growth of the plants; and the latter, from its abſorbent quality, imparts its humidity to the roots of the binds in too ſcanty a proportion for the healthy ſupport of their luxuriant vegetation.

There is, however, a ſort of thin ſlatey ſoil, intermixed with good rich mould, which has an under ſtratum of ſtone, that is found, by experience, to be admirably ſuited to the growth of the hop-plant, and on which it often riſes to its fulleſt height and luxuriance, producing an equally abundant produce with thoſe of the moſt deep, ſtrong, and fertile kinds. Hops are extenſively cultivated on a ſoil of this deſcription in the vicinity of Maidſtone in Kent *.

Hops may be cultivated on ſuch lands as have been in a ſtate of tillage; but in theſe caſes it is abſolutely neceſſary that a ſufficient proportion of manure be applied, to bring them into a proper ſtate of fertility for the perfect ſupport of the plants. Such land as has been long in a ſtate of paſture, and which has, in conſequence, accumulated a large proportion of vegetable matter, as that of old orchards, rich, dry meadows, or other graſs lands, is however the moſt proper for the purpoſe.

In either caſe the ground ſhould be reduced to a perfectly fine ſtate of mould by repeated ploughing and harrowing, or digging it over with the ſpade. This laſt is the moſt effectual method where the land is to be broken up from the ſtate of ſward, and ſhould be performed in the autumn, in order that it may have the advantage of the effects of the froſts during the winter ſeaſon. By theſe means the plantations are not only to be brought into a perfect ſtate of pulverization, but alſo rendered clean, and free from all ſorts of weeds. In the laſt operations, the ground ſhould always be left in as even and level a ſituation as poſſible, if it be ſufficiently dry; but where it is inclined to the retention of moiſture, it may be ridged, in order more effectually to remove the ſuperabundant wetneſs. And immediately before the ſeaſon of planting, a quantity of compoſt, formed from well rotted dung and good freſh vegetable earth, by being intimately blended together and remaining in that ſtate for a conſiderable length of time, ſhould be applied in ſmall heaps, ſo as to afford about a buſhel for each hole.

The buſineſs of planting out the ſets is then to be commenced, which is performed at different times, according to the nature of the plants. Where ſets from

* Banniſter's Synopſis of Huſbandry.

the cuttings of old binds are made uſe of, the work is beſt performed in the latter end of February, in March, or the beginning of April, as the ſeaſon may ſuit; as theſe are the periods of cutting over and dreſſing the old binds, when ſets of this ſort can be the moſt eaſily obtained; but, when bedded, or root ſets are employed, as may ſometimes be the caſe on digging up former plantations, the autumn is the moſt proper ſeaſon, as about the latter end of October, or beginning of November.

In the firſt of theſe methods the ſets or cuttings ſhould be made from the moſt healthy and vigorous binds, each being cut to the length of about five or ſix inches, having two or three eyes or joints, which are the buds, from which the roots and ſtems, or new binds, proceed. They are ſold by the hundred of ſix ſcore, at from ſixpence to a ſhilling. In the planting, different forms and diſtances are preferred by different planters, according to the manner in which the after-culture of the crop is performed. Where it is executed by means of horſe labour, the beſt method is that of ſetting them out in rows, at ſuitable diſtances, ſo as to form ſtraight lines in every direction. But, in caſes where it is to be executed by the hand, this is not of ſo much conſequence, provided a ſufficient ſpace be allowed for the healthy growth of the plants. In this way ſome practiſe the row method, while others prefer a triangular plant. It is evident, however, that the planting in equidiſtant rows, ſo as to admit of the ground between the plants being kept clean by the harrow and nidget, muſt be much leſs expenſive than that of the irregular mode, in which hand labour muſt be employed.

The diſtances at which the plants are ſet out, or rather thoſe of the holes and hills formed for their reception, are different according to circumſtances. Some cultivators adviſe ſix feet and a half or ſeven feet, while others prefer a five or ſix feet plant. As the hop-plant, from the luxuriance of its growth, riſes to a great height, and ſends forth much bind and foliage, it muſt of neceſſity require conſiderable ſpace, as where the plants ſtand too cloſely together they are not only more liable to become diſeaſed, but to *bouſe* or run together above the poles, by which ſo much ſhade is produced, as to prevent the hops below from completing their growth; and of courſe the quantity of produce is much leſſened.

On theſe grounds it would appear that this plant cannot be cultivated with perfect ſucceſs in leſs ſpace than from ſix to ſeven feet: on good rich ſoils the latter diſtance may be the moſt adviſeable, as the plants will be more at liberty to effect their full growth. In this way there will be a diſtance of from eight to nine feet from the centre of the hills.

The holes are ſet out in different ways, according to the particular cuſtom or practice of the cultivators; ſome making uſe of a line, in which knots are formed at the diſtances intended, which is extended the whole length of the plantation, ſmall ſticks being then thruſt down at the knots, and the land meaſured off from theſe by ſticks of a proper length; others mark the holes off at once by means of ſtakes drove down into the ground at ſuitable diſtances each way: but a more expeditious method than either of the above is that of ſtriking furrows by the plough in different directions of the plantations, at proper diſtances, ſo as to form a ſort of ſquares, the holes being made in the angles where the furrows croſs each other.

In making the pits or holes, the earth is taken out by a ſpade or *ſpud*, to the depth of about twelve inches in a circular form, having the diameter of about eighteen inches, the bottom mould being a little ſtirred. Theſe are then partially filled with the earthy compoſt mentioned above; and the mould that was taken away replaced upon it ſo as to make a little riſing or hillock. On theſe hillocks ſeven ſets or roots are moſtly planted by means of a dibble, one in the middle or top of the hill, and the others around it, at equal diſtances, about four or five inches from the ſides of the holes. The ſets are generally put in to the depth of about two inches in the compoſt, and ſo as to have the tops wholly covered by the mould on the ſurface of the hills. Some planters, however, prefer covering them lightly with the fine earth taken from the holes, after they have been planted out in the compoſt, to the depth of an inch and a half or two inches.

Nothing further is now neceſſary till about the middle of May, except keeping the ground about the plants clean from weeds; when, from the increaſing growth of the young plants, it will be proper to apply an addition of fine mould about them on the hills, which may be ſcraped up from the intervals. And in order to check the growth of the young ſhoots, and thereby increaſe the vigour of the roots, ſome twiſt them together into a ſort of knot. Others, however, adviſe that two ſmall ſticks, about a couple of yards in length, be ſet in each hill in order to direct the climbing of the ſhoots, three or more being led up each ſtick, and tied occaſionally during the ſummer with baſs or ſedge. A ſecond moulding up will be required about the latter end of July or beginning of Auguſt, which is to be performed in the ſame manner as before.

There is ſtill another mode of planting practiſed in ſome diſtricts where the land is of the boggy kind and much inclined to moiſture*. This is that of forming the plantations into a ſort of beds about ſixteen feet in width, by digging out trenches three feet in width, and from two to two and a half in depth, ſpreading

* Corrected Agricultural Report of Suffolk.

the earth thus removed evenly over the beds previouſly prepared. On theſe the ſets are put in, after the holes have been made a ſpit in depth, twelve inches in diameter, and ſix feet apart in each direction, ſo as to admit three rows on each bed, in the ſame manner as in the other methods. The plants in this mode are poled in the courſe of about three weeks with old ſhort poles, to each of which two or more of the binds are tied; the land being afterwards kept in order by hoeing and raking. The operation of hilling is performed in the latter end of June or beginning of July. This appears, however, a tedious and expenſive plan, without its poſſeſſing any ſuperiority except that of rendering the lands ſomewhat more dry.

It is the cuſtom with ſome planters to cultivate other ſorts of crops at the ſame time with the hops, as common beans, cabbages, french beans, and onions; but this is a practice by no means to be recommended, as much injury may be done by their crowding the plants and preventing the free admiſſion of air, light, and ſun to them, eſpecially thoſe that are of tall growth. The onion is the leaſt objectionable, as not riſing to any great height, and being capable of being ſown at the time the ſets are planted out.

It is ſeldom adviſeable to take any produce the firſt year, as where this is attempted much injury is frequently done to the future produce of the plantations. In the Suffolk method of planting, a produce of three, four, and even five hundred weight of hops is ſometimes however afforded the firſt year *. And where bedded or root ſets are made uſe of, a ſmall crop may be afforded the firſt ſeaſon, as the plants or binds will be nearly as forward at that time, as thoſe from cuttings are in the ſecond ſeaſon †.

Where hop-plantations have been carefully formed in theſe methods, and the land is perfectly ſuitable to the growth of the plants, they will continue to bear well for twenty years or more, care being only taken to ſupply the defects that may occur in particular hills from the deſtruction of plants. But though this ſort of plantation may be continued in the above manner, it is ſuggeſted as a more adviſeable practice, in many inſtances, to renew them at much ſhorter diſtances of time, or even to keep renewing particular parts occaſionally as may be neceſſary. And in order to render them the moſt productive, whether they are managed by the plough, the ſpade, or the hoe, the ground in the intervals ſhould be well ſtirred two or three times when the ſeaſons are favourable, and in other caſes more frequently ‡.

* Corrected Agricultural Report of Suffolk. † Synopſis of Huſbandry.

‡ Modern Agriculture, Vol. III.

In the following winter after the plantation has been formed, it will be neceſſary to provide and prepare the poles. Where the hop-binds are healthy and vigorous in their growth, two poles may be ſufficient for each hill, or in the proportion of two thouſand ſix hundred to the acre. But where the plants are weak and leſs luxuriant in their vegetation, a greater number of poles will be required, as three to each hill, or at leaſt to each other hill, which in the latter caſe will be in the proportion of three thouſand two hundred and fifty to the acre. But as the poles need not be ſo long, or of ſo much ſtrength, there will probably be but little difference in the expenſe. In bringing the poles they ſhould not be carted upon the ground, but be placed at the outſides, to be afterwards removed by the labourers to the places where they are wanted.

In the ſecond year of the plantation it is ſeldom neceſſary to apply any manure to the hills, but the land in the intervals ſhould be ſtirred in the autumn, in the ſame manner as in the firſt; but in the early part of the ſpring, when the weather is ſuitable, as about the middle of March, the hills muſt be opened, and the earth be well cleared away from the principal roots by means of a tool which has the title of a *picker*, in order to afford the means of pruning and dreſſing the ſtocks; in which operations all the preceding year's bearing ſtems are cut off within a joint or two of the roots, and all ſuch ſhoots or ſuckers as were not permitted to attach themſelves to the poles, or which have riſen on the edges of the hills, fully cleared away, nothing being ſuffered to remain that can poſſibly injure or prevent the vigorous growth of the new binds. In performing this buſineſs, care ſhould be taken to bare the different ſtalks and roots ſo completely, and to ſuch a depth, that every thing that is hurtful may be diſcovered and wholly removed. And in the cutting experienced labourers ſhould, if poſſible, be employed; for much depends on the work being properly executed, as great injury may be done by leaving too great a length of bind, as well as by cutting the ſtocks too cloſely. In the former caſe the crops may be expoſed to the *canker*, and, in the latter, the hills be ſo much weakened as not to afford ſhoots in ſufficient abundance *. It is therefore neceſſary that the work ſhould be carefully overlooked. After the buſineſs of pruning and dreſſing has been thus accompliſhed, the earth ſhould be raked back again upon the plants, ſo as to riſe into hills as before.

At this period all ſuch plants as have been deſtroyed, or that have a weak and unhealthy appearance, ſhould likewiſe have others put in their ſtead, in order that

* Synopſis of Huſbandry.

the plantations may be kept as perfect as poſſible. Such of the prunings as are cut from the moſt healthy and vigorous plants may be reſerved for the purpoſe of forming new plantations.

In this ſeaſon, as well as the preceding, three hoeings and one good moulding ſhould be performed; the firſt about the beginning of May, the ſecond in June, and the third in July; a little mould each time being drawn to the roots of the plants on the hills in order to keep them ſufficiently moiſt. The moulding ſhould take place in the early part of Auguſt, the earth being well laid upon the hills round the root-ſtems of the plants; and it ſhould be executed, if poſſible, ſoon after ſome rain has fallen.

In the poling, which is the next operation to be performed, the common rule is to begin as ſoon as the binds have advanced two or three inches above the ſurface of the ground, which is in general about the latter end of April, or beginning of May. The number of poles that are the moſt proper and advantageous for each hill has not been yet well aſcertained by planters: but as it has been ſhown that a full and free admiſſion of air, light, and ſun, is eſſentially neceſſary to the healthy growth of the plants, they ſhould never be too much crowded. Three is the moſt uſual allowance, though a greater number is often employed. They ſhould be placed in ſuch a manner as to leave the largeſt ſpaces or openings towards the ſouth or ſouth-weſt, that the plants may derive the more full influence of light and heat; and the ſtouteſt on the ſide which has a northern aſpect, the more powerfully to reſiſt the winds. The poles are moſt commonly fixed in the ground by means of an iron craw, with which holes to the depth of eighteen or twenty inches are formed, and the ſharpened root ends of the poles forcibly placed in them, the earth being immediately afterwards well rammed or trodden about them.

The difficulty of this buſineſs chiefly conſiſts in pitching the holes to proper depths, in ſetting the poles down with ſuch exertion as that they may fix themſelves firm at the bottom, and that the tops of the poles may have ſuch a direction outwards as to obviate, as much as can be, the *houſing* of the binds. Where due attention is not beſtowed in theſe points, much injury and loſs may be ſuſtained by the deſtruction of the plants. When the poles are ſet, two or three of the binds may be directed up each of them, being tied, in the manner adviſed above, in different places by labourers employed for the purpoſe, and which is to be repeated as there may be occaſion for it. When the poles are

high and the binds ſtrong, ſtanding ladders may be uſeful in tying them near the tops.

It has been obſerved that this work demands particular attention in the early part of the ſummer. When ſhort and ſlender poles have been put to hills where the binds prove of ſtrong and vigorous growth, it may ſometimes repay the trouble to have them removed, and others of a taller and ſtronger kind put down in their ſtead. The benefit obtained by this practice is often conſiderable *.

During the ſummer, in the more early growth of the plants, the ſuperfluous binds of every kind ſhould be repeatedly removed as they preſent themſelves, reſerving only one or two on each hill to ſupply the places of ſuch as may be hurt in being trained to the poles at firſt, as accidents of this nature often occur in conſequence of the tender buds being bruiſed or rubbed off by the agitation of the winds.

This is the whole of the culture that is required till the ſeaſon at which the hops become ripe, and are ready to be *picked*, which is known by the fragrant ſmell which they emit, their becoming firm, and acquiring a brown colour. It is uſually about the beginning or middle of September.

Much care and circumſpection is neceſſary in the performance of this buſineſs, to ſee that every thing proceeds with regularity and diſpatch, as there is always much danger from delay, the crops being equally expoſed to injury from the winds as continued rain. As a preparation for this buſineſs, *baſkets*, *bins*, or *cribs*, are procured or formed, in number proportionate to the extent of the plantation and the pickers that are to be employed. The latter are conſtructed by nailing four or more pieces of boards on as many upright poſts as frames ſet into the ground. When finiſhed, they are about ſeven or eight feet in length, three feet in breadth, and about the ſame in height. The apparatus being thus made ready, the hop-binds are cut over cloſe to the ſurface of the land by a perſon accuſtomed to the work, and the poles drawn up by a tool for the purpoſe, which is termed a *dog* or *pulling-hook*. They are then placed upon the frame with the bind upon them, moſtly two, but ſometimes three, in order to be picked; three, four, or more pickers being employed in clearing the binds of the hops on each ſide of the different frames: theſe, with the perſon engaged in ſorting the poles, are denominated a *ſet*. Women and children are frequently employed in this work. The hops, after being carefully

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* Kent's Hints.

ſeparated from the leaves and binds, are dropped into a large cloth hung round on tenter-hooks within, underneath the frame. When this has been filled, the hops are put into a large ſack, in order to their being taken home, to be dried on kilns for the purpoſe. This ſhould always be performed as expeditiouſly as poſſible after the hops have been picked, that they may not ſuſtain any injury by remaining together in their green moiſt ſtate; as where this is the caſe they are often liable, eſpecially when the weather is warm, to be much damaged, both in colour and flavour, in the courſe of a few hours, by the heat which they take on. For this reaſon, it is neceſſary to keep the *oaſt* or kiln conſtantly at work, both night and day, during the time of picking. The number of pickers ſhould therefore be as nearly as poſſible proportioned to the quantity of hops that can be dried off by the *oaſt*. And where, from the nature of the ſeaſon or other cauſes, the undried hops are ſuffered to accumulate, they ſhould always be placed only a few together, without being cloſely packed.

In caſes where the crops are pretty abundant, a diligent picker will ſeparate from eight to ten buſhels a day, which, when dried, may weigh about one hundred weight. It is uſual in many places to let the picking of this crop by the buſhel. The price is variable according to the abundance or ſcarcity of labourers. From ſixteen to twenty expert pickers will be neceſſary, in favourable ſeaſons, and where the produce is rather abundant, to keep an *oaſt* at work that is capable of drying off eighty buſhels at each meaſuring *.

Beſides the pole-puller and pickers, another perſon will be requiſite in the hop plantation, in order to pick up the ſcattered branches of the binds, and convey the produce to the kiln. A boy is in general employed in this buſineſs, who, from the nature of his work, is commonly called the *poke boy*. The conveyance of the hops is accompliſhed by means of a cart, horſe, or hand-labour, according to the diſtance of the plantation from the kiln.

The *drier*, or perſon employed in the kiln, ſhould be perfectly acquainted with the buſineſs, regular and ſteady, as much of the planter's profit depends upon this work being properly performed. To this part of the management, as well as that of the pickers, the hop farmer ought to be careful to direct his attention as much as poſſible.

The wages of the different perſons engaged in theſe operations are always conſiderably influenced by local and other circumſtances. In Kent, before the late

* Synopſis of Huſbandry.

advances in the price of all ſorts of farm-labour, it was uſual for the pole-pullers to have from eighteen-pence to two ſhillings the day, with ſmall beer; the driers half a crown, with an unlimited allowance of both beer and ſpirits; the pickers from three halfpence to twopence the buſhel, with allowances of ſpirits, &c. Theſe wages, however, at preſent are greatly advanced.

The ſtructure of the hop kiln, or *oaſt*, is not very different from that employed in drying malt. It may be of different dimenſions, as twelve, fourteen, or ſixteen feet ſquare; and have a ſuitable proportion preſerved between the height and breadth and the ſides of the ſteddle that contains the fire: thus, where the kiln is twelve feet ſquare on the top, it ſhould be eight feet in height from the fire; and the ſteddle ſix feet and a half ſquare. It is covered with hair cloth, on which the hops are ſpread out, in an even manner, to the depth of from ſix or ſeven, to eight, ten or twelve inches, according as the ſeaſon is more dry or moiſt, and the hops are more or leſs advanced in ripeneſs. Before the hops are laid upon the kiln it ſhould be rendered a little warm, and the heat afterwards kept up by a regular gentle fire, increaſing it gradually till, by the heat of the kiln and the warmth of the hops, it is found to have attained the proper height. An even ſteady degree of heat ſhould then be preſerved for eight, ten, or more hours, according to the ſtate of the hops at the time they are applied; by which the ends of the hop ſtems become in a perfectly ſhrivelled and dry condition; which, with that of their rattling on being touched, is the principal indication that they have attained the proper ſtate of dryneſs. Much practical experience is however neceſſary to conduct the proceſs with the beſt effect, and in the moſt economical manner in reſpect to fuel.

Where what is termed a *cockle oaſt* is made uſe of, ſea coal is moſtly employed as fuel, a chaldron being conſidered the proper allowance to a load of hops. But where *hair kilns* are in uſe, as the ſmoke of that ſort of coal would be injurious, charcoal is had recourſe to for the purpoſe, which in Kent is generally bought for about fifty ſhillings the load, which conſiſts of fifty ſacks *.

After the drying has been properly performed, the hops are removed from the kiln by means of a ſhovel, into an adjoining room conſtructed for the purpoſe, which is called the *ſtowage room*. In this chamber they are kept five, ſix, or more days, according to circumſtances, before they are in a proper condition to be put into the bags; as when they are bagged too ſoon they are brittle, and do not *draw* ſo good a ſample, or weigh ſo heavy. They ſhould always remain ſo long as to attain a tolerable degree of toughneſs, which may be eaſily judged of by the feel.

* Synopſis of Huſbandry.

For the convenience of bagging the hops, a round hole or trap is prepared in the floor of the ſtowage room, exactly equal in ſize to that of the mouth of the bag, on which a frame of wood is placed, to which the edges of the opening of the bag are ſecurely attached all round. A very ſmall handful of hops being then tied firmly in each of the lower corners, the bag is let fall below, and a perſon termed the packer gets in, and with a heavy weight, which he keeps continually moving round, where he is not immediately treading, tramples and preſſes the hops down as cloſely as poſſible into the bags, as they are thrown in, in ſmall quantities, by another perſon employed for the purpoſe. In this manner he proceeds until it is quite filled, when each of the upper corners has a few hops incloſed in them in the ſame way as the others, which ſerve the purpoſe of handles; and the bag is drawn up, and the mouth of it well ſecured, after being diſengaged from the frame. In performing this buſineſs, the cloſer the hops are preſſed into the bags the better, as they preſerve their colour, ſmell, and taſte more perfectly *.

In the operations of drying and rendering hops proper for the bag, ſome loſs of weight muſt of courſe take place. According to ſome, ſixty buſhels of well ripened freſh gathered hops, which have not been attacked by the fly, will produce when dried and bagged about one hundred weight.

The goodneſs of a ſample of hops depends upon different circumſtances, as the clammy feel of the yellow, farinaceous, powdery ſubſtance which is ſprinkled over them, and their colour. The former in the language of the hop planter is termed the *condition*, and the ſample is eſteemed the more or leſs valuable by the buyer, in proportion as the feel is more or leſs clammy: and in regard to the latter, it is of the utmoſt importance in the ſale of the hops, that it ſhould be preſerved as bright as poſſible, though it is not always the caſe that thoſe which are the brighteſt in their appearance are the ſtrongeſt in flavour.

It is this property, however, that induces the planter to make a diſtinction in the bagging of the article. The brighteſt hops, and thoſe which have the fineſt colour, are put into bagging of a better quality, and termed *pockets*; while thoſe of the brown kind form bags, being put in bagging of a coarſer and more heavy ſort. The firſt ſort are made uſe of in the brewing of ales and all the finer ſorts of malt liquor; but the latter chiefly in the making of porter. Where hops are to be kept for ſome length of time, the coarſe bagging is however the beſt.

The length for a *bag* is about two ells and a quarter, and that for a *pocket* nearly

* Kent's Hints.

the ſame, each having an ell in width. The former, where the hops are good, well cured, and tightly trodden in, weigh about two hundred and a half; and the latter, when of the Canterbury pocketing, about one hundred and a half. Where they much exceed or fall ſhort of theſe weights, it may be ſuſpected that they are either of an inferior quality, or have been injured in their preparation. The planter will be beſt directed in reſpect to the duty on hops, by a copy of the exciſe laws reſpecting them.

After theſe operations have been performed, it will be proper to clear the poles of the binds, and ſet them up in ſtacks as ſoon as poſſible, unleſs, as is ſometimes the caſe, it has been done at the time of picking, as they are apt to ſuſtain much injury by remaining upon the ground with the bind upon them. The work is uſually performed by the acre, the poles being piled up into ſquare ſtacks; thirty or forty poles being ſet to each corner, which ſhould ſtand about twelve feet apart in each direction at the baſe, the tops uniting as cloſely as poſſible. In this way an opening is formed below, which contributes to dry and preſerve the poles.

At this period all ſuch poles as are too ſhort, or in any way improper for further uſe, ſhould be laid aſide, in order that ſuch of them as are ſuitable may be employed in the new plantations; and that the planter may fully aſcertain the proportion of freſh poles that may be neceſſary for the following ſeaſon, which it is of great advantage to have provided, brought upon the ground, ſet up conveniently in ſtacks, and ſharpened, when there is leiſure in the winter months. The points of the old ones may alſo be put in order at the ſame time, and nothing be thus left to interrupt the buſineſs of poling at the proper ſeaſon. The beſt poles, which are thoſe of aſh, cheſnut, and willow, of the length of from eighteen to twenty-four feet, will ſeldom laſt longer than ſix or ſeven years; and thoſe of an inferior kind, as from beech, maple, oak, &c. not nearly ſo long. The bark is ſhaved off all the ſorts except thoſe of the aſh kind, (in which it ſeparates of its own accord in the ſecond year,) in order to prevent their being deſtroyed by worms lodging in them.

After the poles have been ſtripped and ſtacked up, the bind ſhould be cleared away, which, in ſome diſtricts, is done by tying it up into bavins or ſmall bundles when perfectly dry, and putting it in ſtacks, ſheds, or other convenient places, for the purpoſe of fuel in ovens, &c. This work is performed at the rate of about ſixpence the hundred. In others it is burnt upon the ground; and, in ſome, the labourers are permitted to take it home for their own uſe. But whatever method

is adopted, it ſhould invariably be removed, to prevent its interfering with the future digging of the plantation, which is the next operation to be performed *.

This ſhould be executed as early as poſſible in the autumn or winter months, in order that the land may have the full influence of the froſts. The work ſhould be performed in a dry ſeaſon, and be accompliſhed with as much expedition as poſſible, the moſt careful and truſty labourers being always employed. It is uſually done at a fixed price for one hundred hills, as from two ſhillings to half a crown. The labourer makes uſe of a three-pronged fork, which in ſome places is termed a *ſpud*, for the purpoſe, each prong being about an inch and a half in breadth. It is of great conſequence that this operation be executed in a very perfect manner, much of the ſucceſs of the plantation depending upon it. If there ſhould be any binds of an improper kind, they may be now removed, and others of the proper ſorts put in their ſtead.

And though manure may ſometimes be omitted in the ſecond year where the ſoil is very rich, it ſhould be carefully applied before the buſineſs of winter-digging commences in each ſucceeding one, in the proportion of about twelve full cart-loads to the acre; fifteen loads of good freſh vegetable earth having been well blended and incorporated with it by frequent turning, for ten or twelve months before. In putting this compoſt upon the land, ſmall one-horſe carts with three wheels are ſometimes recommended as the beſt adapted to the purpoſe. It ſhould be laid in ſmall heaps; and, in digging the plantation, be well blended and intermixed with the mould that ſurrounds the hills, at the diſtance of about a foot from them †. The old ſtocks, when they begin to decline, as every tenth or twelfth

* Synopſis of Huſbandry.

† The prices that were uſually paid by the hop planters in the county of Kent, before the late advances in the rates of labour, for the ſeveral different operations in plantations of this ſort, are thus ſtated by Mr. Banniſter:

Expenſes per Acre.

	£.	s.	d.
Stripping and ſtacking poles	0	5	0
Winter digging	0	18	0
Cutting	0	6	0
Poling	0	12	0
Sharpening old poles, at 2d. per ſtack	0	1	0
Carried over	2	2	0

year, or much longer in ſome caſes, ſhould be taken up, and another portion of ground freſh planted; or, what is better, a ſuitable proportion of the old plantation, and an equal portion of new, broken up and planted annually, or every other year, ſo as to preſerve a regular ſucceſſion, at an eaſy and gradual expenſe, as has been already obſerved.

There is ſcarcely any ſort of crop that varies more in the quantity of produce than that of hops, affording, under different circumſtances of ſoil and ſeaſon, from two hundred to upwards of twenty hundred weight on the acre. On medium ſoils, in tolerably favourable years, it may be eſtimated at from ſix to eight or nine hundred weight, from ten to fourteen being conſidered as good crops. A produce of twenty hundred weight but rarely occurs, and is much too large for the planter in general to fix his expectations upon.

The whole of the expenſes incurred in the cultivation of theſe crops, and the profits which they afford, are ſtated in the following manner by Mr. Kent, in his uſeful Hints to Gentlemen Farmers *:

	£.	s.	d.
Brought over	2	2	0
Sharpening new poles, at 3d. per hundred	0	2	0
Shaving ſet at	0	9	4
Tying	0	10	0
Summer digging (if uſed)	0	18	0
Hoeing	0	5	0
Hilling	0	3	0
	4	9	4
Deduct ſummer digging	0	18	0
	3	11	4
Add nidgeting	1	0	0
	4	11	4

Picking, at from 1d. to 2d. per buſhel, and bagging at 8d. coarſe, and 6d. fine.

* *Expenſes per Acre.*

	£.	s.	d.
Medium price of an acre of land ſuitable for hops	1	10	0
Digging the ground	0	13	0
Dreſſing and pruning	0	8	0
Poling	0	15	0
Carried over	3	6	0

The expenſe of forming new hop plantations is very conſiderable. In Suffolk it is eſtimated at from ſeventy-five pounds to one hundred, when every thing that is requiſite is included; the annual charges being nearly the ſame as thoſe which have been juſt ſtated *.

In the county of Kent, where the practice of letting out the culture of crops of this ſort to labourers who are experienced in the buſineſs in ſome meaſure prevails, they are ſaid not only to find a ſaving of expenſe, but to be ſo much relieved, in reſpect to the trouble of the different operations, as to conſider it the moſt adviſeable mode †. In theſe caſes, where ſummer digging is omitted, and

	£.	s.	d.
Brought over	3	6	0
Three hoeings	0	9	0
Once moulding	0	3	6
Tying the binds to the poles	0	12	0
Stripping the binds off the poles	0	3	0
Stacking the poles	0	4	0
Sharpening the poles	0	10	10
Manuring	2	0	0
Picking, drying, and duty, at 1l. 10s. per hundred, the crop being eſtimated at 12 cwt. the acre	18	0	0
Bagging and occaſional expenſe of bags, about	0	16	0
Aſh poles, eſtimated at 30,250 to the acre, and ſuppoſed to laſt eight years, medium price, 18s. a hundred at the ſtub, eighth part of which is nearly	3	13	0
Carriage of ditto, eſtimated at	1	5	0
	31	2	4
Produce.			
Suppoſing 12 hundred per acre, and that the medium price is 4l. the hundred, the amount will be	48	0	0
And the expenſes deducted out of the produce will leave a medium profit of	16	17	8

* Corrected Agricultural Report of Suffolk.

† The account is ſtated in this way:—Undertaker's charge, he paying and finding

	£.	s.	d.
labourers for the different operations	3	10	0
Picking, drying, and duty	13	0	0
Rent of land	1	0	0
Carried over	17	10	0

recourſe is had to the uſe of the nidget, the expenſe will be a few ſhillings more, as is ſhown in the firſt eſtimate;—the difference in favour of this practice from that where the planter procures and pays the workmen, being about one pound the acre *.

The weather moſt favourable to crops of this ſort, in the different ſtages of their growth, is that which is warm without much rain, and where ſouth or ſouth-weſterly winds prevail; as the hop is a plant which never ſucceeds well in ſuch ſeaſons as are wet, or when either eaſterly or northerly winds continue for any great length of time during the ſummer months. Hot gleams of ſun-ſhine after rain, or after foggy mornings, in the later ſummer months, alſo prove highly detrimental to theſe crops. High winds towards the approach of the picking ſeaſon likewiſe produce conſiderable miſchief, by bruiſing and otherwiſe injuring the hops. When unfavourable weather takes place, about the period in which the plants are in bloſſom, it is ſeldom that the produce is good or abundant, as many of the *burs* generally ſuffer in ſuch a manner as to prevent their forming perfect hops.

In moſt caſes the very forward binds ſuffer more from all the different accidents to which hop crops are expoſed, than thoſe that are later and of a leſs vigorous growth. It may, on this account, therefore, ſometimes be adviſeable to remove all the very forward binds.

Theſe crops are expoſed to the attacks of diſeaſe at almoſt every period of their growth. In the very early ſtage of the growth of the hop plant, it is liable to be wholly devoured, as it riſes above the ſurface of the ground, by the ravages of the *flea*. And, in a more advanced ſtate, it is ſubject to the ſtill more prejudicial attack of the *green* or *long-winged fly*, *red ſpider*, and *otter moth*: the firſt of theſe, by the depoſit of their ova, afford the means of producing *lice* in great abundance; by which the plants are often very greatly if not wholly deſtroyed, and the larvæ of the laſt prey upon the roots, and thus render the plants weak and

	£.	s.	d.
Brought over	17	10	0
Poles	6	0	0
Manure	2	10	0
Tythe	0	10	0
Bagging-cloth	2	0	0
	28	10	0

* Synopſis of Huſbandry.

liable to be attacked by other diſeaſes*. The *honey dew* is likewiſe another diſeaſe to which the crops are expoſed about the ſame time, and by which they are often much hurt. The *mould* or *fen* moſtly occurs at a ſomewhat later period, but is equally prejudicial in its effects. There are ſtill other injuries to which hop-crops are expoſed, ſuch as the *blight*, and what is termed the *blaſt*, which occur at different times, but moſtly towards the latter periods of the growth of the plants.

The *flea*, which is aſſerted to be an inſect of the ſame kind as that which is ſo deſtructive to the young turnip, is ſaid to make the greateſt havock in thoſe ſeaſons when the nights are cold and froſty, and the days hot and inclined to be dry. In its attacks it eats off the ſweet tender tops of the young plants; and which, though they are not wholly deſtroyed by it, ſhoot forth afterwards in a much leſs ſtrong and vigorous manner; from which they become more expoſed to the attacks of other vegetable diſeaſes. It has been remarked that this inſect is the moſt apt to commit its depredations on the plants in thoſe grounds that have received a proportion of dung the ſame year. And on the ſuppoſition that dung in its crude ſtate has a tendency to encourage the production of this inſect, it has been ſuggeſted that the manure employed for the purpoſe of covering the hills ſhould be previouſly well mixed and incorporated with good freſh mould for a conſiderable length of time before it is made uſe of, as has been already directed; and that it ſhould be applied either over the whole of the land, or only the hills, immediately after the plants have been cut over: the firſt is the moſt adviſeable practice where manure can be eaſily obtained.

This inſect commits its greateſt depredations in the more early cold ſpring months, as the latter end of April and beginning of the ſucceeding month, diſappearing as the ſeaſon becomes mild and warm †.

The principal remedy in this caſe is that of having the land in a ſufficient ſtate of fertility, to enable the young plants to ſhoot up with ſuch vigour and rapidity as to become quickly incapable of being fed upon and devoured by the inſect. Stirring the mould about the roots of the plants by means of the hoe may alſo be of utility in the ſame intention.

The *green* or *long-winged fly* generally makes its appearance about the latter end of May, and in the two following months. The prevalence of north-eaſterly

* Withering's Botanical Arrangement, Vol. II.

† Synopſis of Huſbandry.

winds about the above period has much effect in producing these insects, which are very destructive of the young leaves of the plants. Under such a state of the wind they are said to scarcely ever fail covering the leaves; and by dropping their ova produce an abundance of *lice*, by which the crops are often much injured, as when they have once obtained complete possession of the plants they seldom or ever leave them before they are wholly destroyed. The forwardest and most luxuriant hop-binds are said to be in general the most disposed to be attacked by insects of this sort. The removal of the insects chiefly depends upon a change taking place in the wind from the above points more to the south, and the setting-in of mild and warm weather.

The *otter moth*, by producing its larvæ upon the roots of the plants, subjects them to be attacked by them, and the healthy growth of the hops to be in that way greatly impaired, the crops being of course much injured in respect to their produce. In this case, stirring the earth well about the roots of the plants may probably sometimes be serviceable.

The *honey dews* mostly occur after the crops have been attacked by some of the above kinds of insects, and when the weather is close, moist, and foggy. In these cases a sweet clammy substance is produced upon the leaves of the plants, which has the taste of honey. They have at first a shining appearance, but afterwards soon become black. The nature of this vegetable affection does not seem to be yet well ascertained. It is supposed by some to be the excrement of insects of the *aphis* kind, deposited by them upon the leaves of the plants after it has been extracted by their puncturing the leaves. Others however contend that it is a morbid exudation proceeding from the plants themselves; which is much more probable, and more consonant to analogy; since from its taste, which resembles that of the vernal sap-juice of plants, and its supporting bees, ants, and other insects, it must be of a nutritious quality *. This supposition is rendered still more probable from the circumstance of its occurring after the insects have been some time present upon the plants, and disappearing long before they leave them †. It would appear indeed that this exudation may in some measure be caused by the punctures of the insects, as it most commonly takes place after the nights have been cold, moist, and foggy, and the succeeding days hot and sunny, the irritability of the plants being so much increased by the former as to render the action of the latter more powerful in promoting the circulation of their juices, and consequently in forcing their passage more abundantly through the fine openings afforded by the punctures of such insects.

* Darwin's Phytologia. † Ibid.

This diſeaſe moſtly happens in the more forward crops. The chief dependence of the planter for its removal is that of heavy thunder ſhowers taking place, as by this means, when the deſtruction of the hops has not proceeded too far, they are often much reſtored, the inſects that devour the leaves and binds being greatly deſtroyed, the growth of freſh ſhoots promoted, and a favourable bloom brought on*.

The *fen*, *mould*, or *mildew*, is a diſeaſe to which the hop is expoſed at a later period of its growth. It chiefly attacks the part where the hop is attached to the ſtem. Its production is greatly promoted by moiſt damp weather and a low ſituation; thoſe hop-crops that grow on low, cloſe, rich grounds being the moſt liable to be attacked by it. It is found to ſoon ſpread itſelf over the whole crop, after it has once ſeized upon any part of it. The nature of this vegetable diſeaſe is not probably yet perfectly underſtood. It has lately however been ingeniouſly ſuggeſted to be a plant of the fungus kind, that is capable of growing without light or change of air, attaching itſelf to the plants already in a morbid condition, and by its roots penetrating their veſſels. On this ſuppoſition, the beſt remedy is believed to be that of thinning the plants, or wholly removing thoſe immediately about it, in order to afford a more free circulation of air, and admit the light more extenſively; by which the vigour of the hop-plants may be reſtored, and the diſeaſe be of courſe removed†. If this opinion of the nature of the diſeaſe be well founded, it is probable that by planting the hills more thinly, and making them at greater diſtances from each other, this vegetable malady might be in a great meaſure prevented from occurring in thoſe ſituations where it moſt frequently ſhows itſelf.

Blights are frequent in hop-crops; but the cauſes of them do not appear to have been yet nicely inveſtigated. They are found to happen at different periods of the growth of the plants, but moſt frequently in the more early ſtages of their riſing from the hills, while the nights are cold and froſty in the ſpring months, and the days have much ſun and heat. The living powers of the plants being in theſe caſes greatly exhauſted in the day-time by the ſtimulus of heat, may of courſe be much injured, or wholly deſtroyed in the nights, from being expoſed to a freezing air, which is incapable of exciting the actions neceſſary to the preſervation of vegetable life.

The *blaſt* is likewiſe a diſeaſe that hop-crops are expoſed to, eſpecially in the later periods of their growth. This is in general ſuppoſed by planters to depend upon or proceed from the particular ſtate of the air or weather. It is more probable however that it may be the effect of lightning, as it occurs for the moſt part at thoſe ſeaſons when it is the moſt prevalent, and takes place in a very ſudden

* Synopſis of Huſbandry. † Darwin's Phytologia.

manner. And beſides, lightning is known to produce ſimilar effects on plants, by exhauſting their irritability, and thus rendering their vital actions incapable of being excited by the ordinary powers that ſupport them *. This is rendered ſtill more probable from the practical fact, that the moſt forward and moſt luxuriant binds are the moſt ſubject to be affected in this way. In expoſures that are particularly liable to have the crops injured in this manner, it may be adviſeable to keep back the growth of the plants as much as poſſible, by extirpating all the moſt forward ſhoots, as well as by employing a leſs proportion of the earthy compoſt in their culture. By having the plants to ſtand at greater diſtances than uſual from each other, advantages may likewiſe probably be obtained.

In the former of theſe two laſt diſeaſes, the preſence of which is ſuppoſed to be much connected with the prevalence of winds from the northern or eaſterly quarters, there is frequently a *flea* produced of a ſimilar kind to that which attacks the binds in their early growth. This is highly prejudicial by preying upon the *condition* of the hops, and thereby diminiſhing their weight, and changing them to a brown colour; which is of much injury in their ſale †.

It is the practice in ſome diſtricts for planters to ſow turnips or ſet cabbage plants, or ſome other ſimilar crops, in the intervals of crops of this ſort; but it is an injudicious method, which ſhould ſeldom or never be attempted, as the hops may be greatly injured by being thus deprived of their due nouriſhment and ſupport, as well as of the full aëration of the ſoil, which can only be effected by the operations of frequently ſtirring and turning over the particles of the mould; which under ſuch circumſtances can never be properly performed. Beſides, as ſuch crops muſt prevent the hop-plants from being kept ſo perfectly clean and free from weeds as might otherwiſe be the caſe; and cannot admit of the turnips or other crops being eaten off upon the land, or of being drawn and carted away, without much injury being ſuſtained by poaching and the treading down of the hills; it is much the beſt way to exclude every ſort of ſecondary crop from the plantation.

The advantages of the cultivation of hops have been differently ſtated by different cultivators; ſome contending that it is beneficial in a very high degree, while others are equally poſitive in affirming that it is a ſort of culture that only affords a very trifling profit. It is evident however that in many ſituations the growth of this plant muſt be extremely beneficial, though, like moſt others, it muſt be ſubject to vary, according to the circumſtances of ſoil, culture, and climate. Experiment has indeed ſhown, that on the deep boggy ſoils, after being rendered

* Darwin's Phytologia. † Synopſis of Huſbandry.

ſufficiently dry, the black vegetable moulds and rich loams, it is a culture that anſwers to a very high degree; and that, under other circumſtances of a much leſs favourable nature, it is ſo profitable as to far exceed common huſbandry *. It may indeed be concluded, that though on lands that are perfectly adapted to theſe crops, and ſo ſituated as to afford poles, manure, and labourers for performing the buſineſs of picking and other operations in ſufficient proportion and at reaſonable rates, they may be highly beneficial both in reſpect to the immediate money profit they afford, and the great improvement that is accompliſhed in the lands from the nature of their culture; yet under other circumſtances, from their precarioufneſs, and their being attended with much trouble, it may be better either to wholly omit them, or only cultivate them on a limited ſcale. And where they are cultivated in connection with farms, it ſhould only be to ſuch an extent as that no injury may be ſuſtained by the other parts either in tillage or manure †.

Woad.—This is a plant which has a thickiſh ſtrong fibrous root that penetrates to a conſiderable depth in the ſoil. It is principally cultivated for the leaves, which, after being properly manufactured, are employed in the art of dyeing in order to produce a blue colour, and alſo as the baſis of black and ſome other colours ‡.

From the nature of its root it obviouſly requires a ſoil which has much depth, and which is perfectly freſh. Thoſe of the rich, mellow, loamy, and putrid vegetable kinds are in general the moſt adapted to it. In Lincolnſhire, where its culture is carried to a conſiderable degree of perfection by ſome cultivators §, the deep, rich, putrid, alluvial ſoils on the flat tracts extending upon the borders of the large rivers are chiefly choſen for the growth of this plant. And experience has ſhown that it ſucceeds in the moſt perfect manner when they are broken up from a ſtate of ſward immediately for its reception. It is frequently the practice of cultivators of this plant to take lands of this deſcription at high prices, for the purpoſe of breaking them up and growing it upon them for a few years;—on the more low rich ſoils, ſometimes for four years, but in thoſe of leſs fertility only for three; and in ſome which are more elevated and expoſed in their ſituations, two is thought ſufficient ‖; perſons accuſtomed to this ſort of culture, who move from place to place and form a ſort of colony, being engaged in the buſineſs. It has been found however, by the ingenious cultivator mentioned above, to be capable of being confined to one ſpot with equal or more ſucceſs, by having a ſufficient extent of ground, for changing the place of its growth as may be neceſſary, and for appropriating an

* Young's Eaſtern Tour. † Kent's Hints. ‡ It is the *Iſatis tinctoria*, or dyer's woad.

§ J. Cartwright, eſq. of Brothertoft, near Boſton. ‖ Corrected Agricultural Report of Lincolnſhire.

adequate proportion annually to the raiſing of the plant, by which the houſes and machinery that are neceſſary for its preparation may be kept regularly in employ.

In preparing the land, it is recommended by ſome to plough it up with a good deep furrow, juſt before the winter commences, laying it in narrow high ridges that it may have the full effect of the froſts. Early in the ſpring another ploughing ſhould be given in the contrary direction, leaving it in the ſame kind of ridge as before. After it has remained in this ſtate ſome time, and weeds begin to appear, it muſt be well harrowed down with a pretty heavy harrow, repeating the operation as frequently as may be neceſſary to render it perfectly fine and clean. In the beginning of June a third ploughing ſhould be performed to the full depth with a narrow furrow, the land being afterwards well harrowed down as in the former caſes. And about the end of July or the beginning of the following month the final ploughing muſt be given, which ſhould be light, and the ſurface left as even as poſſible for the reception of the ſeed *.

Other cultivators, however, take much leſs trouble in this buſineſs. Where the ſoils are ſufficiently dry, they break them up early in the month of February; but where the contrary is the caſe, it is deferred to a later period. In performing the work, great care is taken to plough it in a perfect manner to the depth of about five inches. And in order that the furrow-ſlices may be well turned, laid flat, and nicely jointed, a perſon is employed in the furrows with a ſpade for the purpoſe. This is found requiſite to prevent the graſſy matters from riſing in the ſeams. After this the ſurface is repeatedly harrowed over, in order to raiſe a ſufficient depth of good mould for the drill to work in; and before the ſeed is put in a roller is paſſed over it †.

This method is probably however inferior to that firſt deſcribed, as the land cannot be brought by it to nearly ſo fine a ſtate of mould, or the graſſy material be ſo effectually deſtroyed; it will therefore be apt to riſe and injure the woad plants.

But there is ſtill another method which is more expeditious, and at the ſame time equally effectual with the firſt; and which has an advantage over it in more completely deſtroying the grubs and inſects which are apt to feed on the plants in their early growth. This is that of paring and burning. It is however chiefly practiſed where the ſward is rough and abounds with ruſhes, ſedge, and other coarſe plants.

After this, in the laſt two methods, the land is to be carefully drained by making grips in ſuitable directions, by means of the ſpade, as wherever water ſtagnates the woad plants are ſure to be deſtroyed ‡.

Seed.—This is collected from a portion of the ground that has been left covered

* Martyn's Edition of Miller's Dictionary, art. *Iſatis.*

† Corrected Agricultural Report of Lincolnſhire. ‡ Ibid.

with the beſt plants from the preceding ſeaſon, as they only run up to ſtem and produce ſeed in the ſecond year. It is ſometimes a practice to crop the leaves of the plants that are intended to ſtand for this purpoſe, two or three times in the firſt ſeaſon; but this is an improper cuſtom, as they are thereby much weakened in their growth, and not only afford a leſs quantity of ſeed, but ſuch as is of an inferior quality. It is a better method either not to crop them at all, or but once, as by ſuch management, ſeed of the moſt perfect quality may be obtained. The ſtem ſhould be ſuffered to remain till the ſeeds in the huſks become perfectly ripened; which is known by their attaining a browniſh yellow colour, and the pods having a dark blackiſh appearance. The ſeed ſhould then be gathered as ſoon as poſſible, which is beſt performed by reaping the ſtems in the ſame manner as grain, and then ſpreading them in rows thinly upon the ground if the weather be fine; when in the courſe of a few days they will be in a condition to be threſhed out from the huſks. When they are ſuffered to remain too long, the pods are apt to open, and ſhed the ſeed. The huſk or pod, in which the ſeeds are included, is of a large ſize, but the ſeeds leſs than thoſe of the turnip. It is always the beſt to ſow new ſeed, when it can be procured, in preference to ſuch as has been kept for ſome time; when of the latter kind, it ſhould be ſteeped for twelve or fifteen hours before it is ſown.

In reſpect to the proportion that may be neceſſary to be ſown upon an acre, it muſt depend much upon the ſoil, and the manner in which it is ſown. Where the drill is employed, leſs will be neceſſary than in the broad-caſt method. A rood of land, where the crop is good, will in general afford ſeed ſufficient for eight or ten acres. In ſome places ſix buſhels are made uſe of to the acre, in the broad-caſt method *.

Time and method of ſowing.—The period of putting crops of this ſort into the ground muſt depend in ſome meaſure upon the method of preparation that has been adopted. Where the firſt of the methods that have been mentioned is followed, it muſt be much later than in the other caſes. Early ſowing is in general to be preferred, as there will be leſs danger of the plants being deſtroyed by the attacks of the *fly* or *grub* †. When the weather is ſuitable, and the land in a proper ſtate of preparation, the ſeed may therefore be ſown in the latter end of February or in March, continuing the ſowings, in different portions of land, till about the middle of May, at ſuitable intervals, to vary the times of cropping the leaves of the plants. The late ſowings are generally performed about the latter end of July, or beginning of the following month.

* Corrected Agricultural Report of Northumberland.

† Laurence on Agriculture and Gardening, folio edition.

The manner in which the ſeed is put into the ground is different, according to the nature and ſtate of preparation of the land. When it is in a fine ſtate of mould, the drill, or row method, is the moſt generally practiſed, and is by much the beſt, as the plants may be kept more eaſily clean from weeds, and become more vigorous from the earth being more ſtirred about the plants: but where the contrary is the caſe, the broad-caſt plan is moſtly followed; though it does not by any means admit of the plants being kept ſo free from weeds, or of the mould being ſo well ſtirred about them.

In the firſt method, the ſeed is put in by a drilling machine, ſuch as is employed for turnips, in equi-diſtant rows, about eight or nine inches apart, being covered either by means of a harrow which is attached to the implement, or by paſſing a light common harrow over it afterwards once in a place; and if there be any clods, they ſhould be raked off to the ſides, or into the furrows. In the latter mode, it is diſperſed by the hand in as equal a manner as poſſible over the whole of the land, being then harrowed in by a light harrow, ſo as to leave the land in as even and level a ſtate as poſſible. In either way the land is frequently rolled afterwards, in order to leave the ſurface as even and neat as it will admit of.

When the ſeaſon is favourable and the ſeed is of a good quality, the plants moſtly appear in the courſe of a fortnight; when much attention ſhould be paid to them to ſee that they are not deſtroyed by the *turnip-fly*, or the froſts in thoſe of the more early ſowings; as, where that is the caſe, the land ſhould be immediately ſown again. In ſome places it is not uncommon to ſow the greateſt part of the crops two or three times over. And in the very late ſowings, where the crops are thin on the ground, it is ſometimes a practice to render them more thick by forming holes with a triangular hoe in the vacant ſpaces, and directing perſons to drop ſeeds into them by the hand *: women and children may be employed in this buſineſs. This mode is often practiſed for the late ſpring ſowings till the beginning of June, or even later.

After culture.—As the goodneſs of the woad plants depends upon the luxuriance of their growth and the thickneſs of their leaves, much attention is neceſſary to the after management of the crops. In the ſpring-ſown crops, as well as thoſe that are put-in in the latter part of the ſummer, the firſt hoeings ſhould be performed as ſoon as the plants are fully diſtinguiſhable; as by this means the weeds will not only be prevented from retarding the vegetation of the plants, but theſe, by being thinned out to greater diſtances, will be more at liberty to advance, and become vigorous in

* Corrected Agricultural Report of Lincolnſhire.

their firſt growth, which is a matter of great importance to the ſucceſs of the crop. In the ſecond hoeings, which ſhould be given in the courſe of four or five weeks after the firſt, the plants are to be thinned out to the full diſtances at which they are to ſtand, which may be ſix or ſeven inches, or more, according to the fertility of the ſoil, always leaving ſufficient ſpaces to prevent the plants from being in any way crowded. This buſineſs is in ſome caſes executed in the ſame manner as for turnips, by means of hand-hoes; but in others it is performed by ſmall ſhort *ſpuds*, managed with one hand, while the other is employed in clearing away the weeds; the labourers, who are moſtly women and children, kneeling wilhe they are at work. After this nothing more is done till the firſt cropping of the leaves has been performed, when the plants are again immediately well weeded; and after each cropping the ſame operation is had recourſe to; the extent of crop cleared in the day being, in moſt caſes, weeded before night *.

In the late mode of ſowing, after the ſecond weeding in October, nothing further will be requiſite till the ſpring, about the middle of April, when the work ſhould be again well executed, the mould being fully ſtirred about the roots of the plants, in order that they may derive the fulleſt advantage from the proceſs. This will be ſufficient to keep the plants clean till the taking of the firſt crop; after which the plants muſt be again weeded, and the ſame operation be performed after each cropping of the leaves of the plants, as in the former caſe.

The expenſe of performing this buſineſs will be different in different caſes; but where labourers are in ſufficient number, the firſt hoeing will moſtly be done at about ſix or ſeven ſhillings the acre, and the ſucceeding ones at about half the price, provided it be executed before the weeds have riſen to too great a height. In many places, the buſineſs of weeding and cropping the leaves of the plants is performed by the ſame perſons, at a fixed price for the acre, according to circumſtances.

Gathering the crop.—In the ſpring-ſown crops the leaves are generally ready to be gathered towards the latter end of June or beginning of July, according to the nature of the ſoil, ſeaſon, and the climate. But when put in at a later period in the ſummer, the crops are often fit to be gathered earlier. This work ſhould, however, always be executed as ſoon as the leaves are fully grown, while they retain their perfect green colour and are highly ſucculent; as when they begin to turn

* Corrected Agricultural Report of Lincolnſhire.

pale much of their goodneſs is expended, and they become leſs in quantity and of an inferior quality.

In performing the buſineſs, a number of baſkets are provided in proportion to the extent of crop, and placed in the field, into which the leaves are put as ſoon as they are taken from the plants, which is done by the hand, by graſping them firmly and giving them a ſort of twiſt. On good ſoils, in favourable ſeaſons, the plants will often riſe to the height of eight inches or more; but in other circumſtances they ſeldom attain more than four or five: and where the lands are well managed, in reſpect to the culture of the plants, they will often afford two or three gatherings; but the beſt cultivators ſeldom take more than two, which are ſometimes mixed together in the manufacturing of them. The after croppings, when they are taken, are conſtantly kept ſeparate from the others, as they would injure the whole if blended together, and conſiderably diminiſh the value of the produce. The beſt method, where a third cropping is either wholly or only partially made, is to keep it ſeparate, forming it into an inferior kind of woad. The produce upon an acre of land, when well managed, in favourable ſeaſons, is moſtly from about a ton to a ton and a half. The price varies conſiderably; but for woad of the prime quality it is often from twenty-five to thirty pounds the ton, and for that of an inferior quality ſix or ſeven.

In the parts of the crops that are reſerved for ſeed, it is a practice with ſome cultivators to crop the leaves two or three times the firſt year, and then leave the plants to run up to ſeed in the following; but it is a better practice to only remove the ſide leaves, as in this way the plants are leſs weakened, and the produce of ſeed is much greater. The plants are likewiſe ſometimes fed down by ſheep during the winter ſeaſon; but this, from its tendency to weaken them, is equally improper.

In the preparation of the woad ſeveral proceſſes are neceſſary after being gathered into the baſkets: it is, in the improved method, conveyed in one-horſe carts, ſo contrived as to be lifted from the axis, and, by folding doors in the bottoms, to diſcharge their contents upon the floor above the mill, on being hoiſted up to their proper ſituation: round this floor holes are formed for putting the plants down through, in order that they may drop under the grinding wheels. The mills for this purpoſe have ſeveral wheels for grinding the plants, which have leſs diameters on one ſide than the other, and are about three feet in width, being conſtructed with iron bars for cruſhing the woad. They are wrought by horſes, or any other power, as may be the moſt convenient. The materials are

preſerved under the grinding wheels by proper contrivances, which, as ſoon as they are ſufficiently reduced, force it out of the tracks upon the ſtone floors on the ſides; thus making way for new parcels without the mill being ſtopped. The bruiſed woad is then thrown into rooms on the ſides of the mill, deſtined for its reception, by means of ſhovels. In theſe it remains till the juice is ſo much drained off as to leave it in a proper condition for being formed into balls; which is done by labourers, with apparatus for the purpoſe, and then laid upon trays to be conveyed to the drying ranges, in which they are placed upon grating ſhelves that ſlide on ledges in the drying houſes. Theſe are placed on the ſides of galleries for the convenience of being eaſily placed upon them and removed again. It is kept in theſe till it is ſufficiently dried to be laid up in other rooms, until the whole of the crop has undergone the ſame operations, and the workmen are ready to manufacture it.

In order to prepare it for uſe in the art of dyeing, it is neceſſary for it to take on a proper ſtate of fermentation. This is accompliſhed in the courſe of ſeven or eight weeks, and, in the technical language of the art, is termed *couching*. It is effected by regrinding the balls, in the ſame mill as before, to a fine powder, and then ſpreading it upon the floors of the rooms in which the balls were formed, to the thickneſs of about three feet; where it is then moiſtened with water, ſo as to keep it in a proper ſlow ſtate of fermentation; and ſo managed by turning as that it may pervade the whole in an equal manner. In this buſineſs the direction of an experienced workman is neceſſary. In the turning, it is of much importance that the parts of the materials be perfectly divided, which can only be effected by a nice management of the ſhovel *.

Much advantage has been found in the goodneſs of the woad, from the drying and ſtoring of it being performed in a careful manner. When this attention is neglected, the woad will not, on being broken between the finger and thumb, draw out into fine hair-like filaments, or, in the language of the manufacturer, *beaver* well; as the uſe of this ſubſtance, in the blue vat of the dyer, is not merely to afford the colour of the plant, but, by bringing on a very gentle fermentation, excite the indigo in the ſame vat to yield its colouring principle more perfectly. This is even neceſſary for its own colouring matter being fully imparted. The ſubſtance ſhould therefore be ſo prepared in the different operations as to produce this effect in the moſt certain and perfect manner. When the heat in the proceſs

* Young's Corrected Agricultural Report of Lincolnſhire.

of *couching* has gone too far, the ſubſtance will be what is termed *foxy*; and when it has not proceeded to a ſufficient degree, it will be what is called *heavy*. If the material be good, it does not ſoil the fingers on being rubbed between them; but ſuch as is heavy does. In the concluſion of the proceſs, the cooling is effected in ſo gradual a manner as to render it not fit for taking on the ſame proceſs; and or courſe proper for being preſerved in caſks, or in any other way. It is then ready for uſe *.

This is a ſort of crop that appears beſt adapted to the rich fertile lands that are on theſe accounts, on being firſt broken up, unfit for oats or any other ſort of grain-crop, as it may in theſe caſes be had recourſe to for a year or two, when they will be in a proper clean ſtate for grain; as, from its not returning any thing to the land, it muſt of neceſſity be in ſome meaſure an exhauſting crop: but it does it in a more moderate way than many other ſorts of deteriorating crops; and at the ſame time, from the nature of its culture, leaves the land in a more clean and perfect condition for the growth of other crops.

The ingenious cultivator mentioned above has introduced this plant as a regularly returning crop in the rotation of woad for two, three, or four years; then oats for one or two years; after that cole; then oats again; the land being then laid down to graſs, with white clover, rib-graſs, a ſlight portion of trefoil, the beſt hay-ſeeds, ſome parſley, and a little ray-graſs. Land left in this way, if conſtantly fed down with ſheep and a few neat cattle, it is ſuppoſed, would be in a condition to be planted again with woad in the courſe of ſeven or eight years †.

But as the demands for this article are in ſome degree confined, it is not a ſort of culture that can be extended in an unlimited manner. Beſides, as there is much riſk and anxiety attending the cultivation and preparation of ſuch ſorts of crops, and a great expenſe of machinery, it is probable that many other kinds of root and other crops that are leſs expoſed to hazard in their growth, and trouble in their preparation and after-management, may be grown on ſoils that are proper for this plant, with more profit and advantage.

Where the culture of the plant is however eſtabliſhed, and the neceſſary apparatus provided, its cultivation, by confining it to a particular place, and introducing it in a regular courſe as juſt ſtated, may be extended, and rendered more eaſy and profitable.

Weld.—This is another plant that is cultivated for the ſake of its flower-ſtems,

* Young's Corrected Agricultural Report of Lincolnſhire. † Ibid.

which are employed in the art of dyeing, for the purpoſe of producing the bright yellow and lemon colours *.

The ſoils moſt adapted to the culture of this plant are thoſe of the more fertile mellow kinds, whether of the loamy, ſandy, or gravelly deſcriptions; but it may be grown with conſiderable ſucceſs on thoſe of a poorer quality. In the former, the plants will however riſe to a much greater height, and produce much larger leaves, than in the latter.

In the preparation of the ground, it is neceſſary that there ſhould be a conſiderable degree of fineneſs produced in the mould. This may be effected by different ploughings performed in the more early ſpring-months, and by occaſional harrowing. In giving the ſeed furrow, the land ſhould be left in as even and level a ſituation as poſſible on the ſurface, in order that the ſeed may be diſperſed over it in a more equal and regular manner.

Seed.—It is neceſſary that this ſhould be collected from the beſt plants, and that it ſhould have remained upon the ſtems till it has been rendered perfectly ripe; as that which is not well ripened never vegetates well. The plants deſigned for ſeed ſhould not, however, be let ſtand too long in the field, as the ſeed is liable to ſhed; and it ſhould be perfectly freſh when ſown, as that which has been long kept never comes up well, or in ſo even a manner. As the ſeed is very ſmall, the ſurface mould, by being left in a fine condition, is more fit for its being diſperſed over it equally. The proportion of ſeed that is neceſſary is generally from about two quarts to a gallon the acre, according to circumſtances, where it is ſown alone; but when mixed with other crops a little more may be required. It ſhould be mixed with a little ſand at the time of ſowing it.

Time and method of ſowing.—In this, as in the preceding crop, the ſeed may be put into the ground either in the ſpring, as about the latter end of April or beginning of May; or in the cloſe of the ſummer, as about the beginning of Auguſt; but in the former periods, it is moſtly ſown in conjunction with other crops. But when ſown alone at the latter ſeaſon, the produce is in general the moſt abundant.

This ſort of crop is commonly ſown broad-caſt, whether it be grown in mixture with other plants or alone; and as the ſeeds are of a very ſmall ſize, it requires an expert ſeedſman to perform the buſineſs with regularity and exactneſs; which is a matter of much importance to the ſucceſs of the crop, as, where the plants

* It is the *Reſeda Lutcola*, and is commonly known by the names of *Woold*, *Weld*, and *Dyer's Weed*.

ſtand too cloſely together, much unneceſſary trouble and expenſe muſt be incurred in the thinning them out by the hoe afterwards; and where they ſtand too thinly upon the ground, there muſt be great loſs from the deficiency of plants. In order that the ſowing may be executed with more regularity, it is the cuſtom with ſome cultivators to blend ſome other ſubſtance with the ſeed that has nearly the ſame weight, ſuch as that which has been juſt noticed, as, in this way, they ſuppoſe it to be effected with greater facility and diſpatch.

Where the weld is grown with other ſorts of crops, as barley, buck-wheat, beans, peas, clover, or graſs ſeeds, it is put in after them; in ſome caſes immediately, but in others, not till ſome time has elapſed. With the firſt and ſecond, when ſown ſo late as the beginning of May, it is moſtly the practice of the beſt cultivators to put it in directly afterwards, giving the land a ſlight harrowing with a very light cloſe-tined harrow, to cover it *. With ſome, the barley being put in under furrow, the weld ſeed is immediately ſown upon the ſurface, lightly harrowed in, and then rolled †. But where the barley ſeeding is performed ſo early as March, or the beginning of April, the ſowing of the weld ſeed is beſt deferred till May, when it may be diſperſed over the land, and left in that manner to be waſhed in by the rains ‡. But with beans and peas, it is often put in before the laſt braking or hoeing of the crops in the latter end of June, or beginning of the following month §. When cultivated with clover and graſs ſeeds, it is ſometimes put in at the ſame time with them; but it is probably a better practice to delay it till ſome time afterwards, as both theſe crops require to be ſown at too early a period for this plant.

Where no other ſort of crop is grown with the weld, the uſual method is that of ſowing it evenly over the ſurface of the land, and covering it in by harrowing with a light common or buſh-harrow, finiſhing, when the ſoil is of the light kind, by paſſing a roller over it.

After-culture.—In the common practice of cultivating crops of this ſort, no attention is afterwards paid to them. But as the plants are of ſlow growth, and of courſe liable to be greatly injured in their progreſs by the riſing of weeds, it muſt be of much advantage not only to keep them perfectly clean from them, but alſo to have the mould ſtirred about the roots of the plants. In the courſe of about a month from the time of ſowing, the plants are moſtly in a ſtate to be eaſily diſtin-

* Synopſis of Huſbandry. † Annals of Agriculture, Vol. I. ‡ Ibid.
§ Corrected Agricultural Report of Kent.

guiſhed; a hoeing ſhould, therefore, be then given when the weather is dry, which may be performed in the ſame manner as for turnips, making uſe of ſomewhat ſmaller hoes for the purpoſe. It is adviſed by ſome to ſet the plants out, in this operation, to the diſtance of three or four inches; but it will probably be better to let them have more room, as ſix, ſeven, or eight inches; which will not only leſſen the expenſe of the buſineſs, but contribute to the advantage of the crop. When this operation is well executed, nothing further will be neceſſary till the ſpring, when a ſecond ſlight hoeing may be practiſed about March, in a dry time; and if any weeds riſe afterwards, a third may be performed in May. But where the land has been well prepared, one in the autumn and another in the ſpring may be fully ſufficient. In ſome caſes hand-weeding is practiſed, but it is in general too expenſive a method.

The moſt proper time for pulling this ſort of crop is when the bloom has been produced the whole length of the ſtems, and the plants are juſt beginning to turn of a light or yellowiſh colour; which is uſually about the beginning or middle of July in the ſecond year. The plants are uſually from one to two feet and a half in height. It is thought by ſome cultivators to be advantageous to pull it rather early, without waiting for the ripening of the ſeeds, as by this means there will not only be the greateſt proportion of dye, but the land will be left at liberty for the reception of a crop of wheat or turnips *. In this caſe, a ſmall part muſt be left ſolely for the purpoſe of ſeed.

In performing the buſineſs the plants are drawn up by the roots in ſmall handfuls, which are uſually ſet up to dry, after each handful has been tied up by one of the ſtalks, in the number of four together in an erect poſition againſt each other. Sometimes they, however, become ſufficiently dry by turning without being ſet up. After they have remained till fully dry, which is moſtly effected in the courſe of a week or two, they are bound up into larger bundles, that contain each ſixty handfuls, and which are of the weight of fifty-ſix pounds each: ſixty of theſe bundles conſtituting a load †. Theſe laſt are tied up by a ſtring made for the purpoſe, and ſold under the title of *woold cord*.

As the weld plant is extremely uncertain in its growth, and the whole crop ſeldom becomes in a ſtate to be pulled at the ſame time, it is neceſſary to have an experienced labourer to direct the buſineſs of pulling, in order that the pullers may not proceed at random, but take the different parts as the plants become ready,

* Martyn's edition of Miller's Dictionary, art. *Reſeda Luteola.* † Synopſis of Huſbandry.

or in danger from the blight. In this laſt caſe the greateſt poſſible diſpatch ſhould always be made, as the loſs of weight in the produce will daily increaſe, and the grower be of courſe greatly injured.

When the weld is ſufficiently dried, which may be known by the criſpneſs of the leaves, and the ſtems turning of a light colour, and when the plants are ripe, the ſeeds ſhelling out; according to ſome, it ſhould be ſtacked up lightly in the barn in order to prevent its taking on too much heat *; while others adviſe, that it ſhould be ſtacked up cloſely in the manner of wheat, being left to ſweat in the ſame way as hay, as the more this takes place the better; the quality of the weld being thereby increaſed, if there be no mouldineſs †.

If the crop has ſtood till it is perfectly ripe, the ſeed may be taken before it is put into the barn, which may be eaſily procured by rubbing, or ſlightly beating each of the little handfuls againſt each other over a cloth, tub, or any other convenient receptacle, as, by threſhing, the quantity of the weld would be much reduced in weight. The price of this ſort of ſeed is moſtly about ten or twelve ſhillings the buſhel, which may be ſold to the ſeedſmen.

The produce of crops of this kind is in ſome degree uncertain, much depending upon the nature of the ſeaſon; but from half a load to a load and a half is the quantity moſt generally afforded, which is commonly ſold to the dyers at from five or ſix to ten or twelve pounds the load, and ſometimes conſiderably more. It is moſtly bought by perſons who afterwards diſpoſe of it to the dyers occaſionally as they find it convenient. The demand for it is ſometimes very little, while at others it is ſo great as to raiſe the price to a high degree. The expenſe of cultivating this ſort of crop has often been eſtimated below one pound the acre; but that is much too low where proper attention is beſtowed in preparing the land, and in the hoeing and other management of the crop afterwards. Without taking in the value of the land, tythes, or other charges, it muſt conſtantly ſtand much higher ‡.

* Synopſis of Huſbandry.

† Carter in Annals of Agriculture, Vol. I.

‡ Without any regard to the preparation of the land or the crop with which it is blended, where that mode of culture is adopted, it may ſtand thus per acre:

Expenſes.	£.	s.	d.
Seed, &c.	0	1	9
Sowing	0	0	3
Two hoeings	0	7	6
Carried over	0	9	0

Crops of this kind are particularly liable to be injured by the *blight*, which is probably the reaſon that has induced cultivators to raiſe them with thoſe of other ſorts, eſpecially thoſe of the graſs kind, as by that means, where the weld does not ſucceed, a portion of ſheep-feed may be afforded for winter and ſpring uſe.

The blight frequently comes on ſo ſuddenly, that crops which appeared healthy and in a vigorous ſtate of growth during the winter and ſpring, promiſing a large produce, are about the month of May attacked ſo as to be nearly deſtroyed. It is known by the plants, eſpecially about the lower parts of the ſtems, turning of a yellowiſh or pale reddiſh colour, while the upper parts remain green and ſeem healthy. When it appears early in the month of May there is always danger of the crop being deſtroyed; but when it comes on at a later period, or where the plants from other cauſes, as the dryneſs of the ſeaſon, begin to change colour in the ſhanks, the only chance is that of having them pulled as expeditiouſly as poſſible.

Although the practice of ſowing weld with other crops has been common, it would ſeem more proper to cultivate it alone, as in that way it muſt be much injured and reſtricted in its growth, from the great cloſeneſs and ſhade produced by the plants that ſurround it. The only objection to the cultivating of it alone is, as has been juſt ſeen, in the danger of the crop being deſtroyed by the blight, in which caſe the farmer will have nothing left to repay him for his expenſe and trouble; whereas, when grown with other crops, they may in ſuch caſes in ſome meaſure defray them *.

It is uſual with the cultivators of weld when it is grown with other crops, eſpecially thoſe of the graſs kind, to feed them down, in the winter and ſpring, with ſheep or other ſorts of live ſtock, under the notion that they will not touch the weld plants: but this is not the fact, as they are found to feed upon them, and muſt of courſe be greatly injured in their growth: caution muſt therefore be uſed in directing the feeding down of clover or other crops where the weld plant is preſent.

	£.	s.	d.
Brought over	0	9	0
Pulling the crop and tying it in handfuls	0	8	0
Binding into bundles	0	1	6
Woold cord	0	1	0
Carting and ſtacking	0	3	0
	1	2	6

* Synopſis of Huſbandry.

There can be little doubt but that crops of this ſort may be cultivated with much profit in ſome caſes, where the ſoil is adapted to its growth, and from its nature not diſpoſed to the blight, or to loſe its moiſture too much in the ſummer months; but under the contrary circumſtances its culture ſhould not be attempted. Beſides, from the great conſumption of vegetable matter which it cauſes, without contributing any thing in the way of manure to the land, it can only be introduced with propriety, perhaps, in ſituations where manure can be eaſily obtained *. In theſe caſes, where the crops are cultivated with ſufficient attention, it may be a good preparation for wheat or turnip crops.

When the weld cannot be diſpoſed of ſoon after it is pulled, it may be preſerved perfectly good ſeveral years by being put up in ſtacks, either in the barn or the open air, care being taken to keep it from being injured by the attacks of rats or other vermin.

Madder.—This is another plant of the perennial kind, that is ſometimes cultivated in large plantations in the field, for the ſake of its long thick fleſhy root, which is employed in the art of dyeing, for the purpoſe of giving a ſcarlet colour †. It was formerly much more cultivated in particular diſtricts than it is at preſent; the importations from Holland having leſſened the demands, and reduced the price of it ſo much as to render its culture incapable of being conducted with profit to the farmer.

The ſoils the moſt ſuited to the cultivation of this plant are thoſe of the deep fertile ſandy loams that are not retentive of moiſture, and which have a conſiderable portion of vegetable matter in their compoſition. It may alſo be grown on the more light deſcriptions of ſoil that have ſufficient depth, and which are in a proper ſtate of fertility.

In the preparation of the land for the reception of the crop, it will be neceſſary to plough it up deeply before the winter into high ridges, in order that it may be expoſed to the action and influence of the froſts. Early in the ſpring theſe ridges ſhould be well harrowed down by a heavy long-tined harrow, and then ploughed again in the contrary direction to a good depth; and when, after this, it is not perfectly clean from weeds, or not rendered ſufficiently fine and mellow, another ploughing and harrowing may be given. In the laſt operations, the ground ſhould be left in as level a ſtate as poſſible. It is then ready for the reception of the plants.

* Marſhall's Rural Economy of Norfolk.

† It is the *Rubia tinctoria*.

Sets.—The plants may be obtained either by ſowing the ſeed upon a bed of earth which is rich, and made perfectly fine by digging and raking, in the ſpring, it being lightly covered in, or from offsets or ſuckers from the old plants. In the firſt method, on the plants appearing they ſhould be made perfectly clean by weeding, and be ſet out to the diſtance of three inches in the beds by the hoe. In this way, by keeping the ground quite clean and well ſtirred about the plants they will be ready to ſet out in the ſecond autumn, though it will moſtly be better to defer the buſineſs till the ſpring. The latter practice is the better in this climate, if the ſets can be procured, as the plants ſeldom ripen their ſeed perfectly, or afford it in a ſtate to vegetate well. It requires about twenty thouſand plants for ſetting an acre of land.

Time and method of planting.—The proper time of taking the ſets is ſhown by the plants having obtained the height of ten or twelve inches from the ground, and the ſuckers having thrown out fibrous roots at their bottoms. This may be ſeen by drawing up a few of the plants, and is uſually about the latter end of May or beginning of June. It is quite neceſſary that the ſets have formed root-fibres at the bottoms before they are removed, as where that is not the caſe they ſcarcely ever ſucceed well.

The plants being in this ſituation, and the land prepared as before directed, a ſufficient number of labourers are to be provided, that the work may be performed as expeditiouſly as poſſible. In taking off the ſets, much care is neceſſary not to injure them. Some perform it by means of a dibble with a flat edge, and which is ſhod with iron: this tool, on being thruſt into the ground on the ſide of the ſhoots, divides and ſeparates them by depreſſing the handle, without hurting the fine fibrous roots. The number of plants that can be ſet in a ſhort ſpace of time ſhould only be taken up at once. They ſhould be prepared by having about a third of their top parts cut off. A ſort of thin batter ſhould likewiſe be made by mixing good vegetable mould and water well together, into which the roots of the ſets ſhould be dipped before they are placed in the earth, as by this means the neceſſity of watering the plants afterwards is prevented. This work is executed by a perſon before the planting commences. Two others are employed afterwards in diſtributing the plants ſo as to be convenient for putting into the ground *.

There are different methods employed in ſetting the plants: in ſome caſes they are put in the furrows by means of the plough, while in others they are ſet in beds

* Corrected Agricultural Report of Kent.

by a dibble. The former is probably the better method, and, as being the moſt expeditious, is the beſt adapted to the culture of the plant on an extenſive ſcale. In this, the planter begins by drawing a ſtraight furrow on one ſide of the plantation to a good depth: a row of plants are then laid in it by a perſon for the purpoſe, at the diſtance of five, ſix, or more inches from each other, according to the circumſtances of the land, in ſuch a manner as to lean off from the plough: another furrow is then formed, by the mould of which they are covered. In this manner the work proceeds until the whole is finiſhed.

In the other method the ſets, after the land has been formed into beds five feet in breadth, with two feet between each for intervals, are put in by means of a line and dibble, beginning at the diſtance of ſix inches from the outſides, and ſetting a row of plants at ſuitable diſtances from each other, as juſt mentioned; then removing the line two feet further on them, and putting in another row; after which it is again removed two feet, and a third row of plants ſet in, which finiſhes the bed; the work proceeding in the ſame manner till the whole of the plantation is completed. In this way, each bed contains three rows of plants at two feet diſtance each, three feet being left between the rows on the different beds.

In Holland, where the culture of this root is extenſive, their method is a little different from the above. The plants, after being taken from the older plantations about the month of May, are immediately ſet in rows at the diſtance of three or four inches from plant to plant, and about fifteen inches from row to row, the beds being ten or twelve feet in width, with intervals of only about two feet.

As, in whatever manner the plants are ſet, ſome of them even in the moſt favourable ſeaſons are liable to die ſoon after the work has been performed; it is neceſſary in the courſe of a fortnight or three weeks to look over the ground, and put freſh vigorous plants in the places where the others have been deſtroyed. By this means the plantations may be rendered more perfect and productive.

After-culture.—Whichever method of planting is practiſed, it is of the greateſt conſequence to the ſucceſs of the crop that it be kept perfectly clean from weeds, and that the mould be occaſionally ſtirred about the roots of the plants. The firſt is accompliſhed by means of hand-weeding and hoeing, during the ſummer ſeaſon; and the latter, either by the uſe of a hand-hoe or a light plough. This laſt is the moſt eaſy and expeditious. In this manner, or by digging the intervals of the rows, the mould is alſo laid up to the plants once each year, after the ſtems have been removed in the autumn ſeaſon*. Where the bed practice is followed, they

* Corrected Agricultural Report of Kent.

are ſometimes earthed up in the autumn, after the ſtems have been cut down, by paring the intervals ſomewhat in the manner of thoſe of the aſparagus kind. This method is however, in general, too expenſive and troubleſome where the plantation is extenſive.

The crops are to be managed in this manner until the third autumn after planting, when the plants will be in a ſtate to be taken up. This is known by their ſtalks beginning to wither, and is generally about October. This buſineſs is performed either by trenching the land over with a ſpade, or by means of the plough. The firſt is the more certain though much leſs expeditious method. In executing it, the workmen dig along the rows to the depth of about two feet, breaking and reducing every ſpit of earth as perfectly as poſſible; each being attended by two perſons who pick out the roots of the madder. But when the planting has been done in narrow beds, it is ſometimes the practice to take the roots up, by turning the earth into the intervals by a *ſpud*, or broad three-tined fork. In this way it is ſuppoſed that the roots are taken up more perfectly, and with leſs danger of being injured. But the moſt ready method is by means of the plough, which, after having the earth-board and coulter removed, is paſſed along each ſide of the rows, ſo as fully to looſen the mould; perſons being employed to pick out the roots, looſening ſuch parts of the earth as may have eſcaped the action of the plough by their ſpades.

When the roots have been taken up, they ſhould be expoſed ſome time to the air, in order that they may be rendered ſo dry as to be cleared from the mould. They are then to be conveyed to a kiln, ſuch as is employed for the purpoſe of drying malt or hops, where they are to be brought into ſuch a ſtate of dryneſs as to be perfectly brittle: this is done to prevent the danger of their being injured by becoming mouldy, or from running into a ſtate of fermentation; but much caution is neceſſary in conducting the proceſs. After this they are packed up in bags, in order to be diſpoſed of to the dyer, who reduces them into a powder, by a mill, before they are made uſe of as a colouring ingredient.

The beſt madder is that which, on being broken, has a brightiſh-red or purpliſh appearance, without any yellow caſt.

In order to collect the ſeed of the madder plant, it is neceſſary to let the plants remain in the field till the ſeed is almoſt wholly ripe, which is generally in the month of September: the heads are then to be ſeparated from the ſtems, and expoſed on a cloth in the ſun till the ſeed can be eaſily forced out by ſlightly beating them. It is then to be rendered perfectly clean, and afterwards placed in a ſunny

ſituation until it is become quite dry; for if the leaſt dampneſs remain it will grow mouldy, and its vegetative power be either greatly impaired or wholly deſtroyed. When thus properly dried, it ſhould be put in ſmall bags, and hung up to the cieling of a room where a fire is conſtantly kept.

The produce from the root of this plant is different, according to the goodneſs of the ſoils, but moſtly from ten to fifteen or twenty hundred weight where they are ſuitable to its culture.

It ſeems probable that the cultivation of madder might be rendered a profitable article of field huſbandry in different diſtricts, if the importation of the root from Holland was prohibited; as the event of different trials has ſhown that full crops of good madder are capable of being raiſed. It is ſuppoſed by an intelligent cultivator, that if the price was never lower than three pounds the hundred weight, it might be grown not only with profit by the farmer, but without injury to the conſumer*.

From the high degree of culture which land under this ſort of crop muſt neceſſarily undergo, and its not being ſo much exhauſted as in many other caſes, it muſt be an excellent preparation for wheat or any other crop that requires a clean and fine pulverized condition of the ground.

Teaſel. This is a plant of the thiſtle kind, which is cultivated in the field in ſome diſtricts for its uſe in the dreſſing of cloths, the head being conſtituted of different well-turned vegetable hooks†.

The ſoils moſt adapted to the culture of this plant are thoſe of the more ſtrong and deep kinds, but which are not too rich, as loamy clays, and ſuch as have marley bottoms and are fit for the growth of wheat crops. If broken up from the ſtate of old ley, it is the better; but wheat ſtubbles are ſometimes made uſe of for the purpoſe.

The ſituations the moſt favourable are thoſe that are rather elevated, open, and incline to the ſouth. The high grounds, eſpecially where the country is incloſed, are the moſt advantageous, as the natural ſuperabundant moiſture in the heads of the plants is more completely diſſipated in wet ſeaſons, which in other more low ſituations is apt to lodge ſo long upon them as to cauſe them to decay.

In the preparation of the ground when it is a ley, the beſt method is to plough it up deeply in the beginning of the year, as in the firſt part of February; and where

* Boys's Corrected Agricultural Report of Kent.

† It is the *Dipſacus Fullonum*, or Fuller's Thiſtle.

it is inclined to the retention of moiſture, this ſhould be done in narrow ridges of about three bouts each, the furrow ſlices being laid as even and regular as poſſible, the fine mould from the furrows being raiſed by the plough or ſpade ſo as to cover the ſurface. But in lands that are ſufficiently dry, and which are broken up from ſtubble, the ploughing may be deferred to a later period, and be laid in ridges of much greater breadths and more flat. In either caſe the ſurface ſhould be left in as fine a ſtate of mould as poſſible for the reception of the ſeed.

Seed.—In collecting the ſeed, it ſhould conſtantly be taken from ſuch plants as are the moſt perfect of their kind and the moſt productive in heads, as there is much difference in the quantity that is afforded by different plants, ſome producing nearly a hundred, while others do not afford more than three or four *. It ſhould be ſuffered to remain till it becomes perfectly ripened, and be uſed while freſh, as ſuch as has been long kept ſeldom vegetates in a perfect manner.

The proportion of ſeed that is moſtly employed on the acre is from one to two pecks †, but ſome make uſe of a larger quantity. It is diſadvantageous, however, to ſow the ſeed too thick, as the plants are injured in their early growth by ſtanding too cloſely together.

Time and method of ſowing.—Crops of this ſort are commonly put into the earth about the beginning of April. As the ſeeds vegetate in the moſt expeditious and perfect manner when put in while there is a conſiderable portion of moiſture in the ſoil, the ſowing ſhould never be deferred much longer than this period.

It is moſtly ſown in the broad-caſt method evenly over the ſurface, in the manner that is practiſed with turnips. But before this is performed the land ſhould be well harrowed down, in order to afford a fine ſtate of mould as a bed for the ſeed. It is then to be covered in by a ſlight harrowing with a light ſhort-tined harrow.

This ſort of ſeed may likewiſe be ſown in rows in the drill method, at the diſtance of eight, twelve, or more inches, from each other, in the ſame way as that of the turnips. This method is not, however, much employed by thoſe who are in the practice of raiſing teaſel crops.

After-culture.—As much in the cultivation of crops of this kind depends on the land between the plants being kept perfectly clean and free from weeds; in having them ſet out to proper and ſufficient diſtances; and in having them well earthed up, it is neceſſary that the cultivator ſhould ſee that theſe operations are performed in

* Billingſley's Corrected Agricultural Report of Somerſet.

† Ibid.

a perfect manner. The digging between the plants is uſually executed by means of ſpades which have long narrow bitts not more than about four inches in breadth, having the length of ſixteen or eighteen inches. With theſe the land is commonly worked over in the intervals of the plants three or four times during the ſummer months; and about the beginning of November, when they ſtand too cloſely together, they ſhould be drawn out, in order to fill up any vacancies that may have occurred. When there are ſtill too many plants remaining, it is ſometimes a practice to prepare another piece of ground, into which theſe are tranſplanted. It is, however, found that thoſe plants which are never removed produce the beſt heads *.

In the enſuing winter, as about the latter end of February, the land between the plants is to be again worked over by the narrow ſpades, care being taken that none of the mould falls into the hearts of the plants. And about the middle of May, when they begin to ſpindle, another digging over is given, the earth being raiſed round the root-ſtems of the plants, in order to ſupport and prevent them from being blown down by the wind. Some cultivators perform more frequent diggings, that the ground may be rendered cleaner and more mellow; conſequently the growth of the plants be the moſt effectually promoted †. This buſineſs is commonly termed *ſpaddling*, and is executed with great diſpatch by labourers that are accuſtomed to it: the uſe of the hoe has been attempted by ſome in performing it, but without ſucceſs ‡. After theſe diggings nothing further is neceſſary till the period of cutting, which is generally about the month of July, which is known by ſome of the uppermoſt heads beginning to blow; as, when the bloſſoms fall, they are ripe, and in a ſtate to be cut.

This is a work that ſhould be performed as the heads become ripe; but is moſtly executed at three different times, at the diſtances of about ten days or a fortnight from each other. It is done by means of a knife, contrived for the purpoſe, with a ſhort blade and a ſtring attached to the haft. This laſt is done in order that it may be hung over the hand. A pair of ſtrong gloves is likewiſe neceſſary. Thus prepared, the labourer cuts off the ripe heads along the rows, with about nine inches of ſtem, and ties them up in handfuls with the ſtem of one that is more perfectly ripened. On the evening of the day on which they are cut, they ſhould be put into a dry ſhed; and when the weather is fine and the air clear, they ſhould be taken out, and expoſed to the ſun daily till they become perfectly dry. Much

* Corrected Agricultural Report of Somerſet. † Ibid. ‡ Ibid.

care muſt however be taken that no rain falls upon them. In doing this, ſome make uſe of long ſmall ſtakes or poles, on which theſe handfuls are hung.

After being completely dried, they ſhould be laid up in a dry room, in a cloſe manner, till they are become tough and of a bright colour, and ready for uſe. They are then to be ſorted or ſeparated into three different kinds, by opening each of the ſmall bundles. Theſe are diſtinguiſhed into *kings*, *middlings*, and *ſcrubs*, according to their different qualities. They are afterwards made into packs, which, of the firſt ſort, contain nine thouſand heads, but when of the ſecond twenty thouſand; the third ſort is of very inferior value *. By ſome, before forming them into packs, they are done up into what are termed *ſtaves*, by means of ſplit ſticks.

The produce in crops of this nature is very uncertain, there being ſometimes fifteen or ſixteen or more packs on the acre; and at others ſcarcely any. The produce is diſpoſed of to the cloth manufacturers in Somerſetſhire, Wiltſhire, and Yorkſhire, and in general averages about forty ſhillings the pack. From the circumſtance of the land being under the neceſſity of being kept in a high ſtate of pulverization and cleanneſs, the expenſes of cultivation muſt be conſiderable †.

This kind of crop is extremely precarious, as the plants, eſpecially when the ſeaſon proves wet about the time of bloſſoming, are liable to rot and be deſtroyed.

The uncertainneſs of teaſel crops has induced the cultivators to blend other plants with them the firſt year, ſuch as beans, &c. in order to repay them in ſome meaſure for the great expenſe of tillage and keeping the land clean: but this is

* Corrected Agricultural Report of the County of Somerſet.

† Mr. Billingſley, in his able Agricultural Survey of Somerſetſhire, eſtimates them in the following manner:

Expenſes per Acre.

	£.	s.	d.
Two years' rent	3	0	0
Ploughing	0	15	0
Workmen's labour in digging, &c.	3	15	0
Making out in bundles, tying together, and bands, at 2s. per pack	0	14	0
	8	4	0
Profit	5	16	0
	14	0	0

Average Produce.

Seven packs at 40s.	14	0	0

In this eſtimate tythes and taxes are not however valued.

a practice that ſhould be avoided as much as poſſible, as the growth of the teaſel plants muſt conſtantly be injured by it.

From the nature of the ſoil, the preparation that it undergoes in rendering it fit for the growth of the plants, and the fine ſtate of pulverization and cleanneſs that it is kept in by the after-culture which is neceſſary, it becomes well adapted for the reception of a wheat crop after the teaſels are removed, and which may moſtly be put in on one ploughing. But as the teaſel robs the ſoils on which it is grown of a conſiderable portion of their fertility, as is evinced by its ſucceeding the moſt perfectly on lands that are newly broken up from the ſtate of old ſward; it may not be adviſeable to follow it by ſuch grain-crops, except when the grounds are very rich; but to interpoſe ſome ſort of green crop, either of the bulbous-rooted or ſtem kind.

Liquorice.—This is a plant ſometimes cultivated in the field for the ſake of its roots, which are made uſe of for various purpoſes. It is a hardy perennial of the deep-rooted kind. The ſpecies moſtly grown is the common ſort*, the roots of which are ſaid to be more ſweet and juicy than thoſe of the others. An open ſituation is always to be preferred for this plant.

The ſoils moſt ſuited to the growth of the liquorice plant are thoſe of the deep light ſandy loams, as the goodneſs of the crops depends upon the roots penetrating to a conſiderable depth.

The preparation of the land is effected either by the ſpade or the trench-plough; but the firſt is the more perfect method. In either way the ground muſt be well looſened to the depth of three feet or more, the autumn before the planting is intended; and a ſufficient proportion of well rotted dung then intimately incorporated with the mould. In this ſtate the land is to remain till the time of planting, when another ſtirring of the earth muſt be performed to the ſame depth, the mould being left as light as poſſible.

The land being thus prepared, it is neceſſary to provide a ſufficient quantity of ſets. Theſe ſhould be taken off from the ſides or heads of the old plants, care being taken that each of them have one or two good eyes or buds, and that they be perfectly ſound. They ſhould be about ten inches in length.

Time and method of planting.—The beſt ſeaſon for putting the ſets into the ground is in the early part of the ſpring, as ſoon as the froſts are over, as about the latter end of February or beginning of March.

There are different methods of putting the plants in, ſome preferring the ſetting them on the plain ſurface, while others have recourſe to ſmall beds. On ſoils

* The *Glycyrrhiza glabra.*

that are dry and porous, the firſt may be the moſt adviſable practice; but in ſuch as are retentive of moiſture the bed method may be preferable.

In the firſt mode, the ſets are uſually put in by means of a line, with a dibble of conſiderable length, in rows at the diſtance of two feet from each other, and one foot or more in the rows; the ſhoots being put in ſtraight downwards, ſo as to be covered over about one inch with earth on the top. Where the intervals between the rows are ſufficiently ſpacious, there are conſiderable advantages in the cultivation of the roots, as the earth may be ſtirred and kept clean at little expenſe by means of the plough; and at the ſame time the roots will have room to attain a more full growth.

Where the planting is performed in the latter method, it is the practice in ſome diſtricts to put the ſets in on beds three feet in width raiſed into ridges *. In both theſe methods, it is the cuſtom with many to ſow, at the time the planting is executed, ſome ſmall ſeed-crop, ſuch as onions. In the bed method they are ſown in the alleys: but though in this way ſome advantage may be immediately gained, without much care in removing them from about the liquorice plants, they will be prejudicial to their growth: beſides, they prevent the land, in the intervals of the rows and alleys, from being ſtirred and kept in a perfectly clean ſtate,—a circumſtance on which much depends in the culture of the liquorice root.

After-culture.—It is highly neceſſary that the plants be kept free from weeds by repeated hoeing and hand-weeding during the ſummer months; and towards October, after the onions or other crops, where they are grown, have been removed and the land been well cleaned, a ſlight covering of well rotted dung ſhould be applied. In this ſtate the plants may remain until the following March; when the ground between the rows, or in the alleys, muſt be lightly ſtirred, either by digging or the plough, in order to promote the growth of the plants. Some likewiſe adviſe the tops of the liquorice plants to be annually cut over †. Theſe methods are to be purſued till the third year after planting, when the roots will be in a condition to be taken up; but which ſhould not be performed until the ſtems are wholly decayed, as when raiſed too early they ſhrink greatly and decreaſe much in weight.

The method of taking up the roots is generally by means of trench digging to the full depth of the roots, which is moſtly about three ſpits in depth.

In executing the work three workmen generally follow each other with ſpits, be-

* Corrected Agricultural Report of the Weſt Riding of Yorkſhire. † Ibid.

ginning on the outſide of the rows with the trenches, the laſt having a mattock to aſſiſt him in raiſing the roots. After the roots are taken up, they are thrown on the ground on the ſides of the trenches. The ſame method is purſued with each of the rows until the whole crop is taken up. In ſome caſes, the land in theſe trenchings is left in ſuch a ſtate as to be ready for replanting.

The ſmall lateral roots are then trimmed off, the largeſt being cut into proper lengths for new ſets, and the main roots tied up into bundles for the purpoſe of ſale.

This ſort of crop can only be cultivated in a local manner, as it requires land that has great depth of ſoil, and which poſſeſſes conſiderable fertility. Beſides, it is in ſome meaſure expoſed to uncertainty, being liable to become rotten in wet ſeaſons, and to be much injured in its growth by froſts in the ſpring, and dry weather in the ſucceeding months. As the value of this root depends much upon its being kept in a ſucculent ſtate, and there is conſiderable loſs in weight by its being kept dry, it is the moſt adviſeable practice to diſpoſe of the produce immediately after it is taken up; but where this cannot be done, it ſhould be depoſited in a moiſt ſituation till it can be ſold.

Having thus deſcribed the methods of culture that appear the moſt advantageous in the different ſorts of field-crops, we ſhall conſider the modes of cutting, harveſting, and ſecuring, that are the moſt economical, and beſt adapted to thoſe of the corn kind.

Cutting and Harveſting Grain Crops.—The times and methods of cutting down grain crops, as well as thoſe of harveſting and ſecuring them, vary conſiderably in different diſtricts, and under different circumſtances and kinds of corn. In ſome, as thoſe of the midland and more ſouthern counties, the harveſt commences early, as towards the latter end of July or beginning of Auguſt; and the grain is chiefly cut by means of ſhort ſtiff ſcythes * conſtructed for the purpoſe, with bows of ſmall ſticks, or what are ſometimes termed *cradles*, fixed to the handles in ſuch a manner as to depoſit the heads or ears of the corn, as much as poſſible, in one direction. In this practice, the produce is frequently bound up into a ſort of ſheaves or bundles; while in caſes where the naked ſcythe is made uſe of, the binding is but rarely attempted, the crops being merely raked together, and put in ſmall heaps, till they are in a proper ſtate to be ſecured in the barn or ſtack-yard.

But in moſt of the more northern diſtricts, and in Scotland, where the cutting

* The ſcythes uſed for cutting grain crops ſhould neither be ſo long or ſo thin in the edges as thoſe employed in mowing graſs, as it is not neceſſary to take ſo great a breadth; and where the edges of the ſcythes are thin and fine they are liable to be broken by the ſtiffneſs of the ſtraw.

of the grain begins at a much later period, as about the middle or latter part of Auguſt, the buſineſs is chiefly performed by means of the ſickle or reaping-hook; the handfuls, as ſoon as cut, being placed upon bands made by twiſting a few of the ſtems together at the ear ends. Theſe are moſtly afterwards bound up into ſheaves of different ſizes, according to the nature of the ſituation and climate.

In this mode of cutting and binding the grain, it is moſtly ſet up into what are provincially termed *ſtooks*, *ſtouks*, *ſhocks*, or *hattocks*, which is accompliſhed by ſetting ſix, eight, or ten ſheaves together, with the tops or ear ends inclining againſt each other; after which the whole is capped, or covered over, by dividing two ſheaves quite up to the bands and ſlipping them over the others, in ſuch a manner as that their butt ends may meet in the middle, while the ear ends ſpread fully over the upright ſheaves, and preſerve them from the wet. Theſe top ſheaves, from the manner in which they cover the others, are termed *hooders*.

In almoſt every ſituation, both in the ſouthern and the more northerly parts of the kingdom, the wheat and rye crops are however cut by the ſickle or the reaping-hook, as it is ſcarcely poſſible to cut them with a ſcythe without conſiderable loſs. And beſides, it is of great advantage, in reſpect to the ſtraw, to have the crops bound up into ſheaves in a regular manner. Sometimes a hook which is ſharp on the edge, but without teeth, is made uſe of: the labourer, in performing the buſineſs, hooks up the grain towards him. This in ſome diſtricts is termed *baging*.

In the cutting of grain crops, whether by the ſcythe or the ſickle, there is much difference in different places, in the height at which the operation is performed. In ſome it is the practice to mow or reap the crops as cloſe to the ſurface of the ground as it can be conveniently executed; but in others, eight, ten, fifteen, or more inches of ſtubble are left.

There are advantages and inconveniences attending the cutting of grain crops, both in the ſcythe and ſickle method. The firſt has the advantage of being expeditious, and at the ſame time of being capable of being executed with any degree of cloſeneſs that may be required; but it leaves the produce in an irregular and uneven ſituation, which renders it not ſo fit for being bound up into ſheaves. And beſides, where the corn is very ripe, it may be more liable to be ſhed during the operation, when performed in this manner. It is, however, often the practice, where corn is cut by the ſcythe, to have it bound up into ſheaves, as well as to let it remain in the ſwaths until it is ready for the ſtack; but where the former is the caſe, the grain is moſtly mown inwards towards the crop, the cut grain reſting againſt

the ſtanding corn; while, in the latter, it is cut outwards, and formed into ſwaths in the ſame way as with graſs.

Where the ſickle is employed, the crop is placed with more exactneſs and regularity, and of courſe is capable of being bound up with greater eaſe and facility. And it is probable that there is leſs loſs of grain incurred in the operation. The buſineſs is, however, more tedious and difficult of execution in this way than by the ſcythe.

It ſeems obvious therefore, that where labourers are ſcarce the former method muſt be the moſt adviſeable; but where the contrary is the caſe, it may be the moſt advantageous to have recourſe to the latter.

In regard to the height of cutting grain crops, as the ſtubble which is left in mowing or reaping them is not only nearly uſeleſs to the land, but frequently ſo troubleſome in the culture of it afterwards as to be under the neceſſity of being removed; it would appear to be the beſt and moſt economical practice, in either caſe, to have them cut as cloſe as the nature of the ground will admit. By this means the agricultor will not only have more litter at command for the bedding of his yards, ſtalls, and other places, and conſequently an increaſe of manure, but have the buſineſs more expeditiouſly performed, and with much leſs waſte of the grain; and at the ſame time be freed from the trouble and expenſe of removing the ſtubble *.

It has been ſhown by careful experiment made with the view of aſcertaining the difference between high and low cutting, that there is much advantage in favour of the latter mode †. In this trial, four ridges in the ſame field, apparently equal in quality, were two of them reaped cloſe by the ſurface of the ground, and the other two at ſome height, though not ſo high as in the general practice of the diſtrict. Each of the portions was found to meaſure ſomething more than a quarter of a Scotch acre, which is more than a fifth larger than that of the Engliſh ſtatute acre.

The produce was then ſet up ſeparately into *ſtouks*; and the length of time that eight reapers took to the part that was cut *low*, was found to be one hour and twenty-four minutes; and that taken up by the ſame number, in the part cut *high*, only forty-eight minutes. The expenſe in wages was eighteen-pence each the day, and that of maintenance ſix-pence. The reſult of the experiment on the grain

* Donaldſon's Modern Agriculture, Vol. II. and Perthſhire Agricultural Report.

† Corrected Agricultural Report of the Weſt Riding of Yorkſhire.

being threshed out and measured, and the straw weighed, was found to be greatly in favour of low cutting *.

In order to facilitate the business of cutting grain, different attempts have been made to construct machines for the purpose; but hitherto we believe without complete success. An implement of this kind, which could perform the operation in an easy, correct, and expeditious manner, would be of vast importance to the arable farmer in this uncertain climate, especially as the difficulty of procuring a sufficient number of labourers in such busy seasons has been lately much increased.

In respect to the proper period of cutting the different kinds of corn, it is best shown by the appearance of the crops, as when the grains are become plump and well filled, and the greenness in a great measure removed from the straw and ears by the bleaching effects of the oxygen of the atmosphere, it will in general be necessary to begin the business of cutting. It is, however, the best practice in most cases to begin before the crops are too ripe, especially when the scythe is made use of, as there will be less danger of waste. And the business should always, if possible, be performed when the crops are perfectly dry; as when cut down while wet, they are extremely liable to become mouldy, and injure the sample. Whether the scythe or sickle be made use of in cutting grain crops, it is probably the most judicious and safe practice to bind the produce up into sheaves. It has been remarked by an experienced agricultor, that there are many advantages resulting from it: the waste of grain is much less; the crop is

* It is thus stated in the Agricultural Survey of the West Riding of Yorkshire:

Result.

	£.	s.	d.
Eight shearers (reapers) one hour and twenty-four minutes, at 2s. per day, or 2½d. per hour	0	2	4
Same number of labourers, 48 minutes	0	1	4
Difference of expense in favour of high cutting	0	1	0
Or per acre	0	4	0
One peck and a quarter of wheat more from the low cut portion than that cut high, at 1s. 4d. the peck, is	0	1	8
Fourteen stones (22 averdupois pounds) more of straw, at 2d. per stone, is	0	2	4
	0	4	0
Or per acre	0	16	0
Deduct the increased expense of cutting, and there will remain in favour of low cutting per acre	0	12	0

more quickly placed out of danger from the weather; the labour of carrying, houſing, or ſtacking, is greatly leſſened; the ſtraw, in wet ſeaſons, is much better for the purpoſes of cattle-fodder, and the grain preſerves its colour far better. On the whole, it is likewiſe concluded that the quantity of labour is rather diminiſhed than increaſed: beſides, the buſineſs of threſhing, eſpecially where the work is performed by the machine, is thus rendered much more eaſy and expeditious*.

The looſe method of harveſting, if practiſed at all, can only be employed in the more ſouthern diſtricts, where the harveſt commences at an early period, and where the climate is mild, regular, and ſteady †, as there muſt under other circumſtances be much danger from the crops being ſo fully expoſed to the weather.

In the binding of grain crops, middling-ſized ſheaves are conſtantly to be preferred to thoſe that are very large, as there is not only leſs danger of their becoming mouldy within, but they are more eaſily penetrated by the winds and dried by the ſun. In tying the bands, care ſhould be taken that they do not ſlip too much towards the ear ends of the corn; and that they be made ſufficiently tight for the ſtraw not to ſlide through them during the time of ſetting them up in the field, conveying them to the barn or ſtack, or in the operation of ſtacking; as, where this is not properly attended to by the workmen, there is often much trouble and inconvenience afterwards from the ſheaves falling aſunder.

Wheat and rye crops, as being moſtly free from weeds and having the ſtraw but little imbued with moiſture, will only require to be expoſed to the influence of the ſun and air for a ſhort time, as a few days, in order to render the grain plump, ſlippery, and a good ſample. Much may be effected in this way, by ſpreading out and expoſing the grips, handfuls, or any ſmall portions of the crops, as they are cut down, to the full action of ſuch powers, turning them occaſionally, and carefully binding them up before the evening dews fall upon them. A very little rain is capable of making theſe crops grow, and thereby injuring the value of the grain. It is generally the practice in theſe caſes to ſet the ſheaves up during the ſunny part of the day on their root ends, putting them into *battocks* during the night. In this way they ſoon become fit for the barn or ſtack.

But in barley and oat crops, as well as thoſe of the pulſe kind, a much longer time is requiſite in the field to prepare them for being put up either in the barn or the ſtack. The neceſſary length of time will depend much upon the cleanneſs of

* Marſhall's Rural Economy of Yorkſhire. † Modern Agriculture, Vol. II.

the crops from any weedy or graſſy matters. After being cut, they muſt remain, according to the manner in which the operation has been performed, for ſuch a length of time in the field as is ſufficient to render the ſtems of the grain, as well as any graſſy material they may contain, in ſuch a ſtate of dryneſs, as that when cloſely ſtacked up they will take on little or no heat; as, where the contrary is the caſe, the grain is liable to be ſpoiled by becoming *mow burnt*, or greatly injured in the colour of the ſample.

Where the grain is reaped by the ſickle, the produce is often placed looſely upon the bands in the day, and tied up into ſheaves towards night, being then ſet up into *hattocks*. Theſe, when the weather is fine, eſpecially if the ſeaſon be wet, are expoſed to the action of the ſun and air by taking off the hood, or cap-ſheaves, in the daytime, carefully replacing them as the evening approaches. In bad weather the root ends of the ſheaves are likewiſe turned up towards the ſun.

And in mowing corn crops, where they are afterwards bound into ſheaves, a ſimilar method is purſued in bringing them into a proper condition for being piled up in ſtacks. In executing the buſineſs it is uſual for the mower to be followed by a woman and boy, the latter of whom prepares the bands, while the former, with a long-toothed wooden rake having a ſhort handle, collects the cut grain into parcels about the ſizes of ſheaves, depoſiting them in a quick eaſy manner in the bands, without ſtooping or touching them with her hands. The mower having proceeded to the end of the ſwathe, binds them up as he returns, placing them either upon their root ends, or ſetting them into *ſtooks*; and in the mean time the ſtubble is raked over by the woman in ſo clean a manner that ſcarcely a ſtem is left: this is performed with much eaſe and expedition where the land has been well harrowed over and rolled at the time the crop was put in.

A reaping fork is ſometimes made uſe of for collecting it into ſheaves. This is conſtructed with two prongs below, ſomewhat in the manner of the common hay fork, to which are added at the upper part two upright prongs, by means of which the grain is removed from the ſwathe and collected into ſheaves, the lower prongs raiſing it up while the upper ones prevent its falling backwards, and determine the quantity which is proper for the ſheaf. By this ſimple contrivance the grain may be gathered more regularly and much more expeditiouſly into ſheaves than by mere hand labour. After the grain is become perfectly dry by expoſing it to the ſun and wind in the manner deſcribed above, it is put into the ſtack.

This method of cutting and harveſting grain would appear to be better than that of reaping, as being much more expeditious, and conſequently reducing the num-

ber of labourers that would otherwiſe be neceſſary, and which in many ſituations are difficult to be procured.

The neateſt harveſt work is, however, made by the ſickle, and it is probably the beſt method where a ſufficient number of hands can be procured. The ſickle with teeth ſhould be employed in preference to the *reaping-hook* with a cutting blade, which is uſed in ſome places, as it is a much more expeditious and convenient tool, and performs the buſineſs in a much better manner.

Where the corn crops are cut by the ſcythe and ſecured without being bound up into ſheaves, the ſwathes are in ſome caſes repeatedly turned over till they become ſufficiently dry to be put into the ſtack; but in others, after being a little dried in the ſwathes, they are formed into a ſort of heaps, or cocks, in which they remain till they are ready to be carried into the barn or the ſtack-yard. As ſoon as they have attained this ſtate, they are conveyed as quickly as poſſible to the barn, or ſtack, a number of labourers being employed to rake over the ground. The method of harveſting grain crops in this caſe has much ſimilarity to that purſued in the hay harveſt. It is, however, a ſlovenly waſteful practice, which does not by any means deſerve encouragement, as there muſt conſtantly be great hazard of ſecuring the produce when the ſeaſon is not favourable.

Beſides theſe methods, when the harveſt is late and unfavourable, and the difficulty of preſerving the grain greatly increaſed, others are ſometimes had recourſe to, ſuch as *gaiting* and *hutting* the corn. The firſt of theſe operations is chiefly practiſed when the crops are cut late and in a wet condition, and is performed by tying the ſheaves in a rather looſe manner in the uſual place, and then ſlipping the bands up to the ears. They are afterwards ſet down on the ground on their root ends, in ſo forcible a manner as to give them a good baſis to reſt upon: with experienced labourers, the hand is then thruſt down through the middle of the ſheaves, by which the butt ends are ſpread out and the central parts left open and hollow, more eſpecially thoſe that face towards the ſouth; as, by that means, the air and the rays of the ſun enter and paſs through more freely, from which the grain is better and more quickly preſerved and rendered fit for the mow or the ſtack *.

The *hutting* of grain in the field is moſtly had recourſe to in late wet harveſts, and is a practice often attended with much ſucceſs in the more northerly climates, eſpecially when it can be accompliſhed while the corn is in a tolerable ſtate of dryneſs, immediately after being cut and bound into ſheaves. The huts are formed by

* Modern Agriculture, Vol. II.

building the ſheaves together in ſuch a manner as to ſhoot off the wet as much as poſſible, to the height that the labourer can reach as he ſtands upon the ground, being ſo narrowed up as that they may be covered at the tops by a ſheaf or two, ſpread out ſo as to let the water readily paſs away. They generally contain from about twelve to twenty *ſhocks*, in proportion as the ſtraw is more or leſs bulky. When thus properly conſtructed, the grain may be preſerved, however bad or long-continued the harveſt ſeaſon may be. Grain managed in this way has been found, on the *huts* being taken down after they had been expoſed to the moſt ſevere and heavy rains of the worſt harveſt ſeaſons for five or ſix weeks, in an aſtoniſhing ſtate of preſervation, little injury having been done, except to a few of the top ſheaves; while that in fields adjoining not treated in the ſame manner, though carefully ſet up in ſtooks and hooded, was completely grown and matted together, ſo that each ſtook was a connected maſs of vegetable vegetating matter *. This fact ſhows the advantage of the practice in the moſt clear and ſatisfactory manner, in diſtricts where the harveſts are protracted to a late period, and the weather on that account apt to be wet and unfavourable.

After the grain has been rendered, by ſome of theſe modes, perfectly dry and in a proper ſituation for the ſtack or mow, no time ſhould be loſt in carrying the crops. In performing the buſineſs, whether carts or waggons are made uſe of, the grain is moſtly put upon them by labourers ſtationed in the fields for the purpoſe; and after they have been brought home, are forked up to the ſtacks, &c. by the drivers.

The wheat-crops are in many diſtricts chiefly preſerved in the barns. This is particularly the caſe in the midland and ſouth-eaſterly counties, where they are large; but in various other parts it is the practice to build this ſort of grain, as well as thoſe of barley, oats, peas, beans, &c. into ſtacks in yards contrived for the purpoſe †. This laſt method, when properly performed, is probably the beſt and moſt convenient, as the grain is not only more ſecure from vermin, but preſerved much more free from muſtineſs, and at the ſame time capable of being got at with more eaſe and facility. Beſides, the vaſt expenſe and inconvenience of the buildings are not only avoided, but the danger of expoſing the corn longer out in the field than would otherwiſe be neceſſary obviated, and the waſte of grain by ſhedding, in conſequence of ſuch dryneſs, in loading and carrying, in a great meaſure prevented ‡.

Stacking of Grain Crops.—It is a common practice, when grain is ſecured in

* Modern Agriculture. Vol. II. † Ibid. ‡ Farmer's Magazine, Vol. III.

ſtacks, to allow it to be depoſited upon a baſis formed of large pieces of timber or other kinds of wood, and filled up in the middle with bruſh-wood faggots, or any other materials of a ſimilar nature, a little ſtraw or litter being thinly placed over the whole. This is, however, a dangerous and ſlovenly method, that ought never to be attempted by the correct agricultor. It is a much ſafer, better, and upon the whole a more economical practice, where this mode of preſerving corn is in uſe, to have the ſtacks built upon frames conſtructed of wood, ſtone, or brick. When conſtituted of the firſt ſort of material, they are uſually raiſed upon ſtone pillars or ſupporters, to the height of from two to two feet and a half, the tops being capped or covered over with flat round ſtones of conſiderable dimenſions, ſo placed as to prevent the entrance of vermin. But when made with ſtone or brick, they are built to the ſame height as in the former caſe, in a rather ſlanting manner outwards, and covered on the tops with copings of oak planking or flat ſtones, which project over the edges ſeveral inches, and in that way prevent the depredations of rats and mice on the grain, as well as their lodging in the ſtacks. In both caſes, pieces of timber are placed as a frame in the middle to ſupport the grain.

The firſt of theſe ſorts of *corn-ſtands* is in general the beſt, as being more eaſily as well as more cheaply conſtructed, and at the ſame time permitting the air to enter and circulate with more freedom underneath, in the bottom of the ſtand.

In reſpect to the form of theſe ſtands, it varies according to that in which the ſtacks are made, which is different in different diſtricts. The circular and oblong forms are the moſt uſual; but the long narrow ſhape is probably to be preferred, as it is ſaid to keep the corn better, more dry, and freer from heating *. It is an advantage in this ſort of ſtands that the crops, eſpecially thoſe of the wheat, may be carried and ſtacked upon them much ſooner after being cut than in other circumſtances †. They have likewiſe the advantage of preſerving the grain in a more ſweet condition, when kept till the following ſummer, or for a greater length of time.

Though very different forms are in uſe in building corn ſtacks, thoſe of the long, narrow, ſquare ſhape are probably the moſt advantageous where the quantity of grain is conſiderable; as they ſtand more firmly, have a better appearance, are more conveniently built, and preſerve the corn better than thoſe of other forms. Beſides, they require leſs thatch as well as labour in putting it upon

* Corrected Agricultural Report of Northumberland. † Ibid.

them. But where the grain is only in a ſmall proportion, the round or oblong ſhape may be more proper and ſuitable, as being more readily drawn up in the roof. The circular with a conical top and cylindrical body, diverging a little at the eaves, is eſteemed the beſt form, by ſome*.

In the building of the ſtacks the ſtems ſhould be ſuffered to ſwell outwards, in a very gradual manner, quite up to the eaves, and not be brought up in a perfectly upright or plumb method, as is the caſe in ſome diſtricts; as by this means they will not only be more effectually ſecured from the penetration of moiſture, but require a leſs extent of ſtand. And if well built, they ſtand with equal firmneſs and ſolidity. The proportions that ought to be preſerved in their conſtruction, are in general about two-thirds of the whole, or ſomething more, for the ſtems, and one-third for the roofs; but the difference of form may admit of ſlight variations in theſe reſpects.

The ſizes of ſtacks of this ſort muſt of courſe vary conſiderably according to circumſtances; but they ſhould never be made too large, as there is a great deal more riſk in ſecuring and getting in the grain for them; and from their being built at different times, they do not ſettle all together in ſo perfect a manner, or reſiſt the effects of the weather, and keep the grain ſo well as thoſe of leſs dimenſions, that can be completed at once. Beſides, they are more inconvenient in threſhing out, eſpecially where the flail is employed. The only advantages they poſſeſs are thoſe of taking ſomething leſs in thatch and labour in covering them. In general, from about twenty to thirty two-horſe cart-loads may be ſufficient for one ſtack.

Where grain is ſtacked looſe, in the manner of hay, it is the common practice to have ſeveral perſons upon the ſtack as for hay, the corn being forked up and placed on the ſides all round in a ſimilar manner; after which other parcels are laid round on the inſide of theſe, ſo as to bind them in a ſecure manner from ſlipping outwards; proceeding in the ſame way till the whole middle ſpace is well filled up; when the operator commences another courſe in the ſame method, and goes on in this mode, courſe after courſe, till he has formed the whole of the ſtem; when he begins to take in the roof, in a very gradual manner, in every courſe, until he brings the whole to a ridge or point, according as the ſtack is formed. In order that the roofs may throw off the water in the moſt perfect manner, they ſhould be ſuffered to have a ſlight degree of fulneſs or ſwell a little about the middle, and not be made flat, as is frequently the caſe.

But where the corn is bound into ſheaves, ſeldom more than one perſon is em-

* Corrected Agricultural Report of the County of Perth.

ployed in performing the buſineſs of building the ſtack, except where the dimenſions are very conſiderable; in which caſes it is found neceſſary to have a boy to receive the ſheaves from the pitcher, and hand them to the man who builds the ſtack. In executing this work it is of the greateſt importance that the centre of the ſtack be conſtantly kept in a ſomewhat raiſed ſtate above that of the ſides, as by this means the ſheaves have a ſloping direction outwards, by which the entrance of moiſture is more effectually guarded againſt. To accompliſh this in the moſt perfect method, it is the beſt practice for the operator to begin in the middle of the ſtand or ſtaddle, ſetting the ſheaves together, ſo as that they may incline a little againſt each other, placing the reſt in ſucceſſive rows againſt them till he comes to the outſide, when he carries a courſe of ſheaves quite round, in a more ſloping manner than in the preceding courſes. Having thus formed the bottom of the ſtack, it is afterwards uſual to begin at the outſide, and advance with different courſes round the whole, placing each courſe a little within the other, ſo as to bind them in a perfect manner, till he comes to the middle. Different courſes are to be laid ſomewhat in the ſame way, till the whole of the ſtem is completed; when the laſt outſide row of ſheaves is, in ſome caſes, laid a very little more out than the others, in order to form a ſort of projection for the eaves. Where the ſtem of the ſtack is however formed in the manner adviſed above, this may be omitted without any inconvenience, as the water will be thrown off without touching the waſte of the ſtack. The roof is to be formed by placing the ſheaves gradually a little more in, in every courſe, till it comes to a ridge or point, according to the form of the ſtack. In making this part of the ſtack, great care ſhould be taken to give the ear-ends of the ſheaves a ſufficiently ſloping direction upwards, in order that they may be the better ſecured from wetneſs. And the outſide ſhould be well rounded, in the manner that has been directed above.

Where proper attention is beſtowed in building corn-ſtacks in this way, every ſheaf in the whole will have ſuch a ſloping poſition outwards of the ſtack, or towards the root-ends of the ſheaves, as will afford the moſt perfect ſecurity againſt damp and moiſture *.

In ſtacking wheat-crops, theſe directions require more particular attention; as the ſheaves ſhould have a rather more ſloping direction when placed in the ſtacks, on account of the tallneſs of the ſtraw, in order that they may be the better ſecured againſt the injurious effects of damps.

It is of much convenience and advantage, in the ſtacking of grain as well as hay,

* Farmer's Magazine, Vol. III.

to have a large ſheet or ſail-cloth to place over them in caſe of ſhowers or bad weather, while they are building, and before the thatch is put on; as where this convenience is not at hand, much injury is frequently ſuſtained at theſe times by the ſudden falling of rain.

It is the practice in ſome diſtricts, eſpecially where the ſtacks are made of a circular form, and the weather is wet and unfavourable, to have a funnel or chimney left in them, in order to prevent their taking on too much heat. This is effected by tying a ſheaf up in a very tight manner, and placing it in the middle, on the foundation of the ſtack, pulling it up occaſionally as the building of the ſtack proceeds all round it. And in ſetting up ricks in bad harveſts, it is a practice in ſome places, particularly with barley crops, to have three or four pretty large poles tied together, by winding ſtraw ropes round them, ſet up in the middle, round which the ſtacks are then built. Where grain ſtacks are not placed upon elevated frames or ſtands that are open in the bottoms, it may be uſeful in ſome caſes to leave one or more openings in the lower parts of the ſtacks, that there may be a free circulation of air underneath them*. But except the ſtacks are large, or the grain when put into them in an imperfect condition, ſuch openings are quite unneceſſary †.

It may likewiſe be uſeful, in building large corn ricks, to have a *ſtacking ſtage*, ſo contrived as to be capable of ſtanding cloſe to their ſides, and by that means enable the workman to pitch the ſheaves with more eaſe and convenience to the perſons employed in forming the ſtacks. An eaſy contrivance of this ſort will be deſcribed in ſpeaking of the methods of ſtacking hay.

Thatching of Grain Stacks.—In the thatching and trimming of corn-ſtacks, conſiderable experience, ingenuity and art is neceſſary, in order to perform the buſineſs in a complete manner. The moſt ſuitable material for the purpoſe is good wheat-ſtraw that has not been much bruiſed in threſhing out the grain. But when this cannot be had in ſufficient quantity, rye-ſtraw may be ſubſtituted in its place; which, however, from its rough and ſtubborn quality, is neither ſo neat in its appearance, ſo durable, nor affords ſo ſecure a covering. Barley and oat ſtraw are ſometimes made uſe of for the purpoſe; but they form very indifferent coverings, and ſuch as are not by any means laſting.

There is ſtill another material that may be made uſe of with propriety and ad-

* Farmer's Magazine, Vol. III.

† In the northern parts of the kingdom, they are denominated *fawſes*.

vantage in ſome ſituations. This is the ſtubble of ſuch wheat-crops as have been cut at a great height; which, after being mown cloſe to the ground and raked up, ſerve the purpoſe very well.

In preparing theſe ſubſtances for application, after being well moiſtened with water, they are drawn out in handfuls perfectly ſtraight and even into regular lengths, and the ſhort ſtraw ſeparated, leaving them placed in convenient bundles to be carried to the thatcher.

In the application of the thatch, different methods are purſued according to the nature of the materials employed. When long ſtraw is made uſe of, the operator uſually begins at the eaves or bottom of the roof, depoſiting it in handfuls in regular breadths till he reaches the top; the different handfuls being ſo placed endways as to overlap each other, the upper ends being conſtantly puſhed a little into the bottom parts of the ſheaves. In this manner he gradually proceeds, breadth after breadth, till the whole of the roof is covered, which is uſually done to the thickneſs of about four or five inches. And in order to retain the thatch in its place, ſhort ſharp-pointed ſticks are occaſionally thruſt in, in a ſlanting direction upwards, and ſometimes ſmall ſticks ſharpened at the ends are bent and thruſt in along the top parts and ſides. But as the water is apt to follow the courſe of the ſticks, it is a better practice to make uſe of ropes of twiſted ſtraw for this purpoſe. In ſome caſes theſe are applied only round the bottom parts of the roof and the ſides; while in others, which is a much better and more ſecure method, they are applied in ſuch a manner over the whole ſtacks as to form a ſort of coarſe network nine or twelve inches in width in the meſhes; the ends being well faſtened, either to belt ropes paſſed in ſuitable directions for the purpoſe, or to different parts of the ſtraw of the ſtack. This method of tying on the thatch ſhould conſtantly be practiſed where the ſtack-yards are much expoſed to the effects of the wind, as without ſuch precaution great injury may frequently be ſuſtained.

Where ſtubble is uſed in the way of thatch, it is put on by ſticking one of its ends into the roof of the ſtack, in a regular and exact manner, ſo as that it may ſtand very cloſe and thick: the other, with ſuch looſe ſtraws as may occur, is then cut over, or pared off with a very ſharp tool, for the purpoſe, ſo as to form a neat and impenetrable thatch, having the appearance of a newly thatched houſe *. It is well ſecured in its place by ſhort pegs made for the purpoſe.

In whatever way the thatching of corn-ſtacks is performed, it ſhould never be

* Modern Agriculture, Vol. II.

attempted until they have fully ſettled; as where the contrary is the caſe it is ſure to riſe into ridges afterwards, and by that means admit the water to paſs down into them.

The expenſe and trouble which attends the thatching of corn-ſtacks has been brought as an objection by ſome againſt the practice of ſetting grain up in that method; but it is not by any means neceſſary, in order to have them neat and ſecure, to beſtow either ſo much labour or materials upon them as to juſtify ſuch an objection, though it may be done in ſome inſtances. As they are ſeldom deſigned to ſtand for any great length of time, it is quite ſufficient that they be thatched in ſuch a manner as to effectually prevent the entrance of water, and ſo ſecured that the winds cannot diſturb them. To have the work performed in any other way would be totally incompatible with that diſpatch which is conſtantly requiſite at ſuch ſeaſons. Narrow oblong ricks rounded at the ends poſſeſs many advantages, both in the economy of labour and thatch, over thoſe of other forms that have the ſame contents: beſides, they admit of the thatching being performed at one end before the other is finiſhed, or as the ſtacking proceeds.

But in any caſe the expenſe of thatch is of no great importance, as, when removed from the ſtacks, it ſerves very well as litter for the cart-horſes and other cattle*. And even barley- or oat-ſtraw will anſwer the purpoſe perfectly well when drawn in an even manner and put on with ſufficient care†.

In diſtricts where the ſtubble is left high, it may likewiſe be employed as thatch for grain-ſtacks, as has been already ſeen. But when it is intended to make uſe of it in this way, it ſhould be mown as cloſe to the ground as poſſible immediately after the corn has been removed from the field, being then raked together by means of a large *horſe ſtubble-rake* ‡, and carried to the farm- or ſtack-yard in order to be put up in a ſort of ſtack for future uſe.

When not applied as thatch, it may be made uſe of in the way of litter for the cattle-ſtalls and fold-yards with great advantage. The practice of collecting it from the fields ſhould therefore be conſtantly attended to as much as poſſible, as other ſorts of ſtraw may be ſaved thereby, and at the ſame time much manure produced.

In regard to the methods of trimming grain-ſtacks after they have been ſet up and thatched, they are differently performed in different diſtricts. In the ſouthern parts of the kingdom, where the injudicious practice of houſing grain looſe fre-

* Communications to the Board of Agriculture, Vol. I. † Ibid.
‡ Section on Implements

quently prevails, it is an uſeful mode to pare or cut the outſides of the ſtems of corn-ſtacks in an even neat manner, by means of a ſharp hay-knife or ſome other ſharp tool. In this way the rain is more effectually prevented from being abſorbed or taken into them along the looſe ſtraws. But where the grain is cut by the ſickle and bound up into ſheaves this is unneceſſary, if the operator take ſufficient care in building the ſtacks. In this, as well as the preceding method, it will, however, be advantageous to have the thatch evenly cut round the eaves and other parts where it may project, as the rain will thereby be leſs apt to fall againſt the bodies of the ſtacks in bad weather, and at the ſame time give them a neater appearance.

Threſhing of Grain.—In threſhing out grain different methods are purſued. The wheat-crops, in ſome diſtricts where the ſtraw is much uſed for the purpoſe of thatching farm buildings, is laſhed out over a ſtrong wattled hurdle, ſtone, or other ſimilar contrivance. In other caſes, this as well as all the other crops are threſhed out by means of the flail or the threſhing machine.

The flail method, from its being an extremely ſlow, tedious, and expenſive proceſs, and at the ſame time one that requires a great number of labourers, can, perhaps, only be practiſed with advantage on the ſmaller kinds of arable farms, that are cheaply ſituated in reſpect to the command of workmen, and where the expenſe of large machines would be much too great for the quantity of grain which they produce. But even in theſe caſes, if the ſmall hand threſhing-engines that are conſtructed on cheap ſimple principles, and which occupy but little room, ſhould be brought to perform the buſineſs in an eaſy, expeditious, and effectual manner, which ſeems not improbable from the improvements that have been recently made in this ſort of machinery, it will moſt probably be to the advantage of ſuch farmers to abandon it, as the ſaving in various ways muſt ſoon repay them the expenſe of the machines, and at the ſame time afford them a conſiderable profit.

Beſides, where the threſhing is performed by the flail, expenſive barn-floors, either of the fixed or moveable kind, will conſtantly be neceſſary. The latter ſort may, indeed, ſometimes be capable of being converted to other purpoſes. In this way too the produce is conſtantly expoſed to the depredations of the perſons that are employed in executing the buſineſs, which, in many caſes, proves a ſource of great loſs to the farmer, as he cannot by any means prevent the impoſitions to which it is liable. It has been well obſerved by the intelligent ſurveyor of a ſouthern diſtrict, that where threſhers are employed by the day, they frequently

do not perform half the work that ought to be done in the time, nor even that in a perfectly clean manner; and, that if it be executed by the quarter or the truſs, the freeſt corn is threſhed out and the reſt left in the ear *. The ſame thing takes place in a greater or leſs degree in every other method that can be adopted for having the threſhing performed by the hand; it is conſequently only by the general introduction and uſe of the threſhing machine, that the property and intereſt of the farmer can be fully ſecured, and the work be executed with that degree of economy which the greatly increaſed price of labour demands.

The ſuperiority of the method by machinery over that of the flail is very conſiderable in many other reſpects, beſides thoſe of its executing the work in a much more clean and perfect manner †, and with infinitely greater diſpatch, ſo as to admit of the farmer being preſent during the proceſs. Sufficient ſupplies of both corn and ſtraw may at any time be almoſt immediately provided, either for the purpoſes of ſeed, the market, or the feeding of animals, without the other operations of the farm being in any degree interrupted. It is likewiſe obtained with much leſs waſte of the grain, and with leſs danger of its being injured by being bruiſed.

From the increaſing ſcarcity of labourers, the great advances in the price of labour in all the well-cultivated diſtricts, and the impoſſibility of having this ſort of work performed in a clean manner by the flail, the neceſſity as well as utility of theſe machines ſeems eſtabliſhed. The principal obſtacles to machines of this nature being more generally made uſe of, are chiefly thoſe of expenſe in their erection, and the ſlovenly practice which prevails in ſome of the more ſouthern diſtricts, of ſecuring grain crops in a looſe manner. The firſt of theſe objections may probably, however, be obviated by the conſtruction of hand threſhing-engines; and the latter by the diſcoveries and improvements that are daily taking place in this ſort of machinery. The objections that have been raiſed againſt the practice, on the ſcore of its depriving labourers of employment during the winter ſeaſon, are ſcarcely deſerving of notice, as experience has fully ſhown that no injurious con-

* Corrected Agricultural Report of Middleſex.

† It was found by the author of the Survey of Kent, on having different parcels of wheat-ſtraw of thirty-ſix pounds each threſhed out clean by the flail, by different farmers, and the ſame weight of ſtraw threſhed after it came from the machine; the average produce of corn left in the ſtraw by the common mode of threſhing was half a pint in every thirty-ſix pounds of ſtraw, more than that left in the machine method.

ſequences can reſult from it, as there muſt always be work enough of other kinds at ſuch periods, where farms are under a judicious mode of cultivation *. And the inconveniences that may attend the largeneſs of the quantity of ſtraw that muſt be at once produced in this method, may be eaſily obviated either by placing it immediately in cloſe ſtacks, or by having a part of it cut into chaff and laid up in a well-ventilated granary, as, in this way, there can be little doubt but that it will keep well, provided the operation has been performed while the ſtraw is dry. Beſides, by the uſe of one horſe or hand-machines the work may proceed without this trouble, as the ſtraw is wanted for the uſes of the farmer, which, in the caſe of ſtore cattle being fed with it, may be a more advantageous practice. But where the fold-yard and cattle-ſtalls are kept properly littered, and as frequently changed as may be neceſſary for promoting its converſion into manure, the farmer will ſeldom be much incumbered with ſtraw.

The ſaving of expenſe in this mode of threſhing, over that by the flail, muſt be different according to the nature of the machine and the power by which it is wrought, as well as the ſtate and condition of the grain, and the regularity with which it is ſupplied. By ſome it is ſtated as about one half, while others make it much leſs than that proportion †. With the beſt conſtructed machines we apprehend it will be performed, on an average of different ſorts of grain and different ſtates of them, at one-third the expenſe of the flail method, or, perhaps, much

* Modern Agriculture, Vol. II.

† In the different ſorts of grain the expenſe and produce of a day's threſhing are thus ſtated by the author of the Corrected Agricultural Survey of the County of Kent:

Wheat.	£.	s.	d.
Eight men, at 1s. 8d. each	0	13	4
Four boys, at 1s. each	0	4	0
Four horſes, at 2s. 6d. each	0	10	0
Cleaning and meaſuring 24 quarters, at 3d. each	0	6	0
	1	13	4

Which is about 1s. 4d. per quarter, or nearly half the price of the flail method.

Barley.	£.	s.	d.
Cleaning and meaſuring 32 quarters, at 3d. each	0	8	0
Other expenſes, as above	1	7	4
	1	15	4

leſs, without taking into the conſideration any thing for the great ſaving in grain *, or the other operations that may be performed at the ſame time, ſuch as thoſe of winnowing or cleaning the corn, cutting ſtraw into chaff, bruiſing and grinding the grain for cattle food or other uſes.

Where threſhing-machines are made uſe of, it is adviſed by the writer of the Agricultural Survey of the Weſt Riding of Yorkſhire, that the barns in which they are erected ſhould extend into the ſtack-yards, as by that means the machines are more conveniently ſupplied, and at much leſs expenſe of labour, with the grain in the ſtraw. Theſe threſhing-engines ſhould likewiſe be adapted to the ſize of the farms, as by proper attention in this reſpect much expenſe may frequently be ſaved.

In threſhing corn by the flail it is the practice in ſome diſtricts for only one perſon to be employed upon a floor; but as two can threſh together with equal if not

Oats.	£.	s.	d.
Cleaning and meaſuring 40 quarters, at 1d. each	0	3	4
Other expenſes, as before	1	7	4
	1	10	8

Or a little more than half the price of that by the flail; this ſort of grain being commonly threſhed at about 1s. 3d. per quarter.

This is without the late improvements in the machines of this kind, by which they are capable of performing the work with much fewer hands, as well as of cleaning the grain and executing ſeveral other operations, by all of which the above charges would be ſtill much leſſened.

But in the Corrected Agricultural Report of Northumberland it is remarked, that a threſhing-machine is employed there that has been found, on trial, to threſh at the rate of thirty-three buſhels in the hour, or two hundred and ſixty-four in the day of eight hours. The expenſe in the attendance of the threſhing and dreſſing parts of it being merely that of three women; one to feed in, another to hand the ſheaves to the feeder, and a third to take away and riddle the corn after it is winnowed: conſequently the threſhing and dreſſing the above number of buſhels only coſts one ſhilling and ſixpence, while the threſhing the ſame quantity by the flail would be one twenty-fifth part, or ten and a half buſhels, which, at two ſhillings the buſhel, is twenty-one ſhillings; to which muſt be added two ſhillings for the expenſe of a man and two women to aſſiſt in winnowing: which makes in all twenty-three ſhillings.

In the north riding of Yorkſhire, according to the Corrected Agricultural Survey of that diſtrict, threſhing by the machine is undertaken in oats for ſixpence, and wheat a ſhilling the quarter, the farmer finding horſes.

* In the ſame work it is likewiſe ſtated, that in this, ſome reckon a profit of at leaſt five per cent.; others, as equal to the ſeed and price of threſhing, which is ſomewhat more than half the price of the flail method; this ſort of grain having of late been uſually threſhed at about 1s. 6d. the quarter.

greater expedition, it muſt be an ineconomical and diſadvantageous mode. But where more than two labourers threſh together, which is ſometimes the caſe, there muſt be frequent interruptions, and a conſequent loſs of time. The tool by which this ſort of buſineſs is performed ſhould be well adapted to the ſize and ſtrength of the perſon who makes uſe of it, as when diſproportionately heavy in that part which acts upon the grain, it much ſooner fatigues the labourer, without any advantage being gained in the beating out of the grain. The beſt method of attaching the different parts of the implement together is, probably, by means of caps and thongs of good tough leather: iron is however ſometimes employed. In threſhing moſt ſorts of corn, but particularly wheat, the operators ſhould wear thin light ſhoes, in order to avoid bruiſing the grain as much as poſſible. In the execution of the work, when the corn is bound into ſheaves, it is uſual for the threſhers to begin at the ear ends and proceed regularly to the others, then turning the ſheaves in a quick manner, by means of the flail, to proceed in the ſame way with the other ſide, thus finiſhing the work.

When much threſhed grain has accumulated on the threſhing-floor, it is neceſſary to ſeparate the ſhort ſtraw and chaffy matter from it, by paſſing the whole through a wide riddle or ſieve for the purpoſe. This ſhould always be done before too much grain has been collected, as in that way the bruiſing of the grain may be more effectually prevented. The ſhort chaffy ſubſtance thus ſeparated is in ſome diſtricts termed *cavings*, and is capable of being employed with advantage in the feeding of horſes or neat cattle. After this has been accompliſhed, the looſe grain ſhould be thrown up to the ſides of the floor, or, what is better, into a chamber conveniently formed for its reception, where it ſhould remain till a ſufficient quantity has been collected to render the clearing of it by the winnowing machine or other contrivance neceſſary.

It is almoſt impoſſible to aſcertain the quantity of grain that a labourer can threſh out in the courſe of any given period of time, as it is obvious that much muſt depend on the nature of the grain, the freeneſs with which it threſhes, and the exertions of the labourer: in general it may be of wheat from one to one quarter and a half; of barley from one and a half to two quarters; of oats, moſtly about two in the day. The exertions of labourers in this ſort of work in the northern diſtricts of the kingdom, are however much greater than in thoſe of the ſouth; of courſe a much larger proportion of labour muſt be performed. In ſome places it is the practice to threſh by the meaſure of grain, as the buſhel, quarter, &c. while in others it is done by the threave, of twenty-four ſheaves, and in ſome by the day.

In Kent, before the late riſe in the price of labour, it was uſual to pay from two ſhillings and ſix-pence to three ſhillings the quarter, for the firſt of the above ſorts of grain; two ſhillings the quarter for the ſecond; and one ſhilling the quarter for the third *. And in the midland and northern diſtricts the prices are nearly the ſame, or perhaps a very little lower in the latter. In the above county beans are likewiſe threſhed at one ſhilling the quarter, and peas from one ſhilling and ſixpence to two ſhillings the quarter. But in whatever way the farmer has this ſort of buſineſs executed, there is always much neceſſity for his conſtant inſpection, in order to prevent the frauds and impoſitions that are too frequently practiſed.

All ſorts of grain and pulſe, when the ſtraw is intended to be made uſe of as cattle fodder, ſhould only be threſhed out as the ſtraw is conſumed, as it is eaten much better, and is more nutritious in this freſh ſtate than when given them after it has been laid by ſome time after being threſhed. And the ſame is the caſe with the *caving-chaff* or other material ſeparated from the grain †.

The grain as ſoon as threſhed out ſhould conſtantly be cleaned from the chaff and other extraneous matters, as by delay in this reſpect the ſample is liable to be much injured. There are different methods of having this buſineſs performed; the beſt is probably by means of the improved *winnowing* machines, as the work is executed in this way in a very cheap perfect manner, and at the ſame time with much eaſe and diſpatch.

In ſome diſtricts it is however the common practice to have the grain cleaned by means of the *caſting-ſhovel* and flat broom, which is denominated a *ſpry*, which ſerves the purpoſe of ſweeping off the chaffy materials and the ſmall portions of ſtraw that are detached by the wind from the corn. Where the barn-floors are ſufficiently large in all directions, this mode of clearing grain is conceived by ſome to be the beſt and moſt expeditious, but that where the room is confined, winnowing machines will not only do the work better but perhaps at a more cheap rate ‡. The other methods of rendering grain clean by expoſing it to the action of the wind, on the threſhing-floor of the barn, or before the ſails of a machine, though practiſed in ſome diſtricts, are ſo imperfect and troubleſome as to deſerve no attention from the enlightened agricultor.

Where the corn is cleaned in the firſt of the above methods, there is in moſt of the improved machines of the *winnowing* kind a ſcreen through which the grain paſſes after it has been cleaned from the chaffy ſubſtances, and by which

* Synopſis of Huſbandry. † Ibid. ‡ Boys's Agricultural Survey of Kent.

the ſmall ſeeds of all ſorts, as well as other foreign matters, are readily ſeparated from the corn. This proceſs is particularly neceſſary with wheat and barley. And if theſe grains be cleaned without the *winnowing* machine, it will of courſe be requiſite to let them through a corn-ſcreen afterwards, in order to remove any ſmall ſeeds they may contain, as well as the ova of different ſorts of inſects, by which the production of the weevil, moth, beetle, &c. is prevented; and the depredations which they commit, while in their vermicular ſtate, on different ſorts of grain, effectually obviated. Implements of this nature may be had ſeparately, but the buſineſs is much more conveniently and cheaply executed at once by the winnowing machine.

Preſerving of Grain.—After the grain has been thus rendered clean, it is in a proper condition either to be ſent to the market, or for being laid up in a ſtate of preſervation. As the prevention of all ſorts of corn from being affected by the different cauſes that have a tendency to injure it, when laid up for the purpoſe of keeping, depends upon its being put by in a perfectly dry condition, and on its being afterwards preſerved in that ſituation,—in order to effect theſe objects in the moſt perfect manner, it is of the greateſt importance to keep the corn, from the firſt period of its being threſhed out of the ſtraw, as much as poſſible from coming in contact with earth, ſtone, or other ſorts of floors that are placed near to or upon the ground, as they have conſtantly much diſpoſition to communicate moiſture, and by that means greatly injure the grain. And another method is by preventing the entrance of the atmoſpheric air as much as can be done, whenever it is in a heavy damp ſtate, by being too much loaded with humidity; as in this way, from the vaſt extent of ſurface that is expoſed to its influence, it is ſubject to be very much damaged, the large quantity of moiſture thus imparted to the corn bringing on a ſort of mouldineſs, which is attended with a muſty diſagreeable ſmell that leſſens its value in a very conſiderable degree, as well as prevents its keeping.

The chief remedy in the firſt caſe, is by cautiouſly avoiding the too common practices of permitting the grain to remain upon the threſhing-floors, eſpecially thoſe of the earth or ſtone kinds, after it has been threſhed out, before being cleaned from the chaff; or, after being cleaned, by depoſiting it upon them either in a looſe ſtate or when put up in ſacks. A perfectly dry room or bin ſhould conſtantly be provided for its immediate reception, the buſineſs being performed as much as poſſible in a dry ſtate of the atmoſphere. And in the ſecond, a great deal may be accompliſhed by means of proper ſlides, ſhutters, or other ſuitable contrivances being conveniently fixed in the pipes, funnels, or other openings intended for the purpoſe

of ventilation, in the corn-rooms or granaries, which should be kept closely shut up whenever the atmosphere is so much charged with moisture as to prove detrimental to the grain.

And as frequent turning or stirring the grain, and ventilation, are found by experience to be essentially necessary for preserving and keeping it perfectly sweet and fit for sale, it is obvious, on the above principle, that this should only be attempted when the weather is fine, or the air in a dry elastic state. In damp weather, or when frost prevails, it should be excluded as much as possible. Besides air, light is likewise advantageous in the preservation of corn, under similar circumstances, as, without its being admitted, a sort of vegetable mucor, usually denominated mould, is apt to fix upon the grain and produce much mischief, as it is said to possess the same property as that of other funguses, of growing where there is scarcely any change of air, and in situations where there is little or no light, provided there be a suitable degree of warmth and moisture*. On the same principle, with the intention of retaining the grain in a state as free as possible from dampness, it might be useful to have well constructed stoves in the bottom parts of corn chambers or granaries, for the purpose of occasionally communicating such moderate degrees of heat to the grain as would be sufficient to dry up and expel any injurious moisture, that it might have attracted in damp wet seasons. On this ground it has indeed long ago been advised on the basis of experience, by an intelligent writer †, to preserve wheat by exposing it to the action of a sunshine degree of heat, on a hair cloth in a malt-kiln, produced by the combustion of clean straw, for such a length of time as may be necessary to remove the dampness; as from four or five to ten or twelve hours, according to the proportion in which it may exist. In this method the heat should always be kept so moderate as not to destroy the vegetative property or life of the grain; as by that means its putrefaction and decay would be promoted. The degrees of heat that would be the most calculated to answer the purpose in different cases would be easily regulated by those instruments that are in common use for measuring the heat and moisture of the atmosphere.

The principles advanced above, assist us much in reconciling the differences of opinion, that have so long prevailed in respect to the use of air in the preservation of corn in granaries; as they sufficiently show that when admitted in its perfectly dry and elastic state, it must be particularly useful in carrying off any moisture or disagreeable smell that the grain may have contracted by remaining closely heaped together for some length of time; as by the stirring which mostly accompanies the

* Darwin's Phytologia. † Mr. Tull.

ventilation it muſt operate in a very extenſive manner; but that when applied in its moiſt heavy ſtate, it muſt be detrimental in an equal proportion, by imparting its humidity to the corn, and by that means cauſing it to become muſty.

The ventilation of grain ſhould conſequently be performed when the weather is fine, but never when the air is in a damp condition, or in the time of froſt. This is the moſt completely effected by ſtirring the corn by proper ſlides or other contrivances in the floors, windows, and other openings in the granaries or corn-rooms *; but it may be accompliſhed in a more ſlow and of courſe in a more uneconomical manner, by ſhovels, rakes, or other ſimilar tools. But in order that this operation may be more readily as well as more perfectly executed, the grain ſhould never be ſpread too thickly over the floors of ſuch granaries or ſtore-rooms. From one to two feet or two feet and a half in depth, in proportion as it gets more dry and free from moiſture, is fully ſufficient for the purpoſe; as from the natural moiſture of the corn when heaped together to too great a thickneſs at firſt, it is ſometimes apt to take on too much heat, by which the quality or ſample is greatly injured. Soon after its being depoſited, frequent ſcreening ſhould alſo be practiſed, and afterwards occaſionally according to circumſtances. There are likewiſe other circumſtances to be attended to, by which the due ventilation and preſervation of the corn is much influenced, ſuch as thoſe of having the doors, windows, and other principal apertures of the buildings placed towards the ſouth, and as cloſe to the ceiling as may be, ſo that the rays of the ſun may enter as freely as poſſible. Beſides, the linings of ſuch corn-rooms ſhould always conſiſt of materials that have not a tendency from their coldneſs to precipitate the moiſture from the atmoſphere, which is often the caſe when warm damp ſouth-weſt winds take place after cold north-eaſt ones, and in that way impart it to the corn that comes in contact with them †. In every caſe the prevention of the entrance of wet or moiſture ſhould be effected by ſheltering boards, ſlides, or other ſimilar contrivances.

Some management in the turning or ſtirring of the grain is alſo requiſite, in order that ventilation may take place in the fulleſt and moſt complete manner. When the grain is firſt depoſited and poſſeſſes much natural moiſture, it ſhould be much more frequently turned over, than afterwards when it has acquired a greater degree of dryneſs. Once or twice in every week or ten days may be requiſite the firſt month; afterwards, for four or five months longer, about once in the fortnight may in general be ſufficient, and after that period only once in the month, except when the ſeaſon proves very moiſt and warm ‡.

* Section on Implements. † Phytologia. ‡ Communications to the Board of Agriculture, Vol. I.

In some places empty spaces are left on the sides of the heaps of corn and other parts, into which they may be turned over when necessary. But in others, square holes are formed in the ends of the floors, and round ones in the middle, by which contrivances the grain is thrown from the upper to the lower chambers, and back again, by which it becomes more perfectly agitated and exposed to the air. This method is practised in some parts of Kent.

As such frequent turnings in these methods are extremely troublesome and expensive in being executed by the shovel, sliding shutters have been contrived in the middle of the different floors which have an inclination towards the centre of the granaries, by the occasional removal of which, and the opening of the windows and ventilators, the grain is turned and ventilated at the same time with great facility and convenience. Monsieur du Hamel has found this mode of preserving grain to answer extremely well, even in cases where it was laid up in a moist state.

But grain may be preserved without having recourse to the process of ventilation, by having it deposited, when in a perfectly dry state, in such dry deep wells, pits, or other situations below the surface of the ground, as that it cannot be affected by heat, or the changes that take place in the season. But though corn has been known to have been preserved in this method for a great length of time in countries where it is the practice to store it up for times of scarcity, it is not by any means so safe or so convenient a mode as the former.

In whichever method corn is secured, care should be taken that such as is moist, or has been badly harvested, be not laid up with that which is dry and in a perfectly sound condition; as from the quantity of moisture that it contains, and the state of germination that takes place in consequence, a musty bad smell is apt to be imparted to the whole, and the sample be wholly spoiled *.

But besides the danger to which grain is exposed when laid up, from the want of dryness and ventilation, it is liable to be destroyed by the depredations of animals of different kinds, in the states before they assume that of the insect †. As these are produced from ova deposited among the grain by the animals when in their more perfect or insect growth; it is obvious that the best means of guarding against their ravages is that of preventing their generation by the destruction of the ova before they assume the vermicular state. This is best effected by frequent screening and exposure to a current of fresh air; as by these means the nests which contain and protect them are broken and destroyed, and the animals after passing through the screen in the different operations are wholly removed with the other extraneous matters.

* Modern Agriculture, Vol. II. † The Moth Weevil and Beetle.

The expoſure of grain to the free action of the atmoſpheric air has been condemned by ſome from the circumſtance of the ova of inſects being liable in that way to be depoſited among the corn; but it is more probable, when the economy of ſuch inſects is conſidered, that their ova are either depoſited originally among the grain in ſuch ſituations, or brought in with different parcels of corn from other places. On this laſt account great caution ſhould be uſed in bringing freſh parcels of grain to be laid up, and the uſe of the ſcreen be conſtantly had recourſe to before it is attempted.

Where corn is to be preſerved for a conſiderable length of time, though it may unqueſtionably be kept with ſafety by proper care and attention in granaries or corn-chambers, it is probably a much better, as well as more certain and economical practice to ſuffer it to remain unthreſhed from the ear, in the ſtack, eſpecially when built on proper ſtaddles in the manner that has been deſcribed above.

In caſes where the corn is ground, and afterwards preſerved in the ſtate of meal, it is the beſt practice to pack it as cloſely as poſſible, by treading into perfectly dry ſmall cloſe rooms, as when laid up in proper condition in this way it will keep perfectly ſafe for ſeveral years.

When it is neceſſary to preſerve grain for any length of time after it has been threſhed out, it is obvious that proper granaries ſhould be provided; the ſize of which ſhould conſtantly have a relation to the extent of the farm, being always ſufficient to contain one half of the corn that is produced when it is threſhed out. In their erection the proprietor ſhould probably, in all caſes, except where there are very long leaſes, be at the whole of the expenſe.

But though the practice of preſerving grain in ſtacks or granaries, from the convenience and advantages that may in ſome caſes ariſe from it, both to the farmer and the public, may be in ſome degree neceſſary, it is evident from the reſult of experiments carefully made*, that the ſtoring of corn in either way ſhould be carried to as little extent as poſſible, as there is found to be a conſtant decreaſe in its weight, from the period at which it has been harveſted or laid up, but that at firſt this loſs is conſiderably greater than when the corn has been kept for ſome time†. On

* Holt in Hunter's Georgical Eſſays, Vol. II.

† In theſe experiments,

Wheat,

	lb. oz. drs.
On being rubbed out in the hot ſun, and weighed the 31ſt of Auguſt, 1789, ſoon after being cut, afforded	0 2 11
On being weighed again on the 18th of October	0 2 7
Loſs of weight per buſhel of 70lbs. nearly	6 8 3

Or almoſt one tenth of the whole in forty days. Of this wheat thirty-two grains weighed one penny weight.

theſe grounds it is therefore ſufficiently obvious, that the ſooner the produce is brought to the market, the greater muſt be the advantage to the proprietor, provided other circumſtances be the ſame.

Having thus explained the culture neceſſary in tillage lands, and the modes of cutting, managing, and preſerving the different ſorts of produce, we ſhall proceed to the means of reſtoring them to graſs.

Lands proper for Tillage and Graſs.

It is obvious from what has been already advanced, that ſome ſorts of land are much better calculated for the production of grain crops than thoſe of the graſs kind; while, on the contrary, there are others that are much more ſuitable and better adapted to the raiſing of graſs than corn crops. There are ſtill others that may be cultivated under a convertible ſyſtem of corn and graſs, with more ſucceſs than in either of the other methods alone.

Of the firſt deſcription are all thoſe lands which poſſeſs a ſufficient degree of dryneſs, whether they have much ſtaple or depth of mould or not, and which in their natural ſtate have but little tendency to produce good herbage, ſuch as thoſe covered with different ſorts of coarſe plants and vegetable productions, whether in an open or incloſed ſtate. It has been well obſerved by a late writer, that grounds of this nature are of conſiderably more value when in a ſtate of tillage than in paſture;

It is however obſerved that this is the greateſt poſſible loſs that grain can ſuſtain, as though it was fully ripened it had neither had the advantage of being dried by expoſure to the ſun after being cut, or undergone the proceſs of fermentation after being put together.

	lb. oz. drs.
Another quantity weighed on the 22d of October, produced	0 6 3
Weighed again twenty-four days afterwards, afforded	0 6 0
Loſs in that time per buſhel, at the rate of	2 1 15
A further quantity weighed on the 8th of January, 1790, produced	0 2 2
Loſt per buſhel, on being weighed again thirty-two days afterwards, at the rate of	2 0 15

Barley,

On being weighed September the 2d, under ſimilar circumſtances, produced	0 2 2
On being again weighed October the 18th, afforded	0 1 12
Loſs of weight per buſhel of 60lbs.	8 4 22

Or about one ſeventh of the whole in forty-ſeven days. Twenty-four grains of this barley weighed one penny-weight two grains.

as they are particularly adapted to the improved modes of huſbandry, and in addition to the quantity of grain to be produced from them, will afford a greater quantity of vegetable food for animal ſtock when in a tillage ſtate, than they did when kept entirely in paſture *.

There are various deſcriptions of light lands that may likewiſe be kept in a ſtate of tillage with more advantage than in that of graſs, as they are peculiarly ſuited to thoſe improved modes of cultivation that are neceſſary for raiſing large ſupplies of green food for the ſupport of live ſtock of different kinds. The poorer ſorts of ſand lands, where marl, clay, chalk, or other ſimilar ſubſtances can be readily procured, are much more proper for the purpoſes of tillage than thoſe of graſs, as is ſufficiently ſhown by the improvements that have been made in many of the more ſouthern diſtricts of the kingdom †. Lands of the chalky kinds, whether of the more ſuperficial or deep deſcriptions, are in moſt caſes better ſuited for tillage than graſs, as from their wetneſs in the winter ſeaſon, and their openneſs and friability in the ſummer, it is almoſt impoſſible to eſtabliſh good herbage ‡.

And there is ſtill another ſort of land that is better for the purpoſes of tillage than thoſe of graſs, which is that which in the ſtate of graſs is conſtantly ſo diſpoſed to the production of moſs, as to afford but a very ſcanty ſhare of good herbage.

Moſt of the clayey and more heavy deſcriptions of land, eſpecially when ſituated in valleys, or other low confined expoſures, though they may be capable of affording good crops of particular kinds when under the plough, as thoſe of the wheat and bean kind, are, on account of their retention of moiſture, the increaſed expenſes of labour, and the uncertainty of ſeaſon for tilling them, as well as their inaptitude for moſt other ſorts of crops, and their fitneſs for the production of good herbage, much more beneficial in the ſtate of graſs than in that of tillage. Where there is an opportunity of procuring ſea ſand, and of applying it at an eaſy expenſe, they may however be converted to the purpoſes of tillage in a profitable manner. Moſt of thoſe ſtrong cold graſs lands which in a ſtate of tillage would be improper for the growth of turnips, and other applications of improved cultivation, ſhould alſo conſtantly remain in the ſtate of graſs. And likewiſe thoſe lands that are ſituated near large towns, where manure is plentiful, and of courſe capable of being procured at a reaſonable rate; and where the produce of ſuch lands is always in great demand, and therefore capable of being diſpoſed of to great advantage. Such lands as are ſituated on the banks of large rivers or brooks, which are capable of being improved by means of watering, are likewiſe more beneficial when kept conſtantly under the graſs ſyſtem than any other mode of cultivation that can be practiſed. The lands

* Davis in Communications to the Board of Agriculture, Vol. III. † Ibid. ‡ Ibid.

of a calcareous nature which are diſtributed in the valleys of the more mountainous diſtricts, where old graſs land is ſcarce and of much importance, and moſt part of that in the ſtate of tillage incapable of being converted to the condition of good graſs, may alſo be the moſt advantageous when continued in a permanent ſtate of herbage. The ſorts of land that are the moſt adapted to the practice of convertible huſbandry are thoſe of the loamy kinds, which are not too ſtrong for the growth of turnips. Theſe in all their different varieties are capable of being changed from the ſtate of tillage to that of graſs, and the contrary, not only without ſuſtaining any injury, but frequently with the moſt evident advantage, as the practice of ſome of the weſtern and midland diſtricts has fully proved *.

The richer kinds of ſandy lands are in moſt caſes alſo well ſuited to this ſort of huſbandry; eſpecially where marl is at hand, to be applied at the time of laying them down to the ſtate of graſs.

And grounds of the peaty ſort may in many caſes be the moſt beneficially employed in this mode of culture, as, from their producing little elſe than plants of the aquatic kind, it is obvious that they muſt be completely deſtroyed, and thoſe of the proper graſs kind be introduced, before any uſeful herbage can be produced. And this is capable of being accompliſhed in by much the moſt perfect manner under the ſtate of tillage. But as they are in moſt inſtances much too tender and moiſt for the purpoſe of remaining long in the ſtate of tillage, as ſoon as the above intention has been fully effected, they ſhould be reſtored to the ſtate of permanent graſs †.

Laying Lands down to Graſs.—It is evident therefore that ſome ſorts of ſoil are much more difficult to be brought into the ſtate of graſs than others, and that, when this object has been attained, ſome are much more profitable and advantageous than others, as affording a much better and more permanent herbage. In ſome diſtricts the buſineſs of reſtoring the land to the ſtate of ſward, after it has been in that of tillage, is effected with the greateſt eaſe and facility: the ground, on being left in an unploughed condition, from its natural tendency to the production of herbage, returns to the ſtate of ſward, almoſt without trouble, ſeed, or expenſe; while in others all the art of the moſt careful agricultor is found inſufficient for accompliſhing the purpoſe. It has been remarked that "after twenty years fruitleſs expectation and expenſe, the landholders have frequently been obliged to reſtore the land again to a ſtate of tillage ‡."

* Communications to the Board of Agriculture, Vol. III. † Ibid.

‡ Davis in Communications to the Board of Agriculture, Vol. III.

But beſides this diſpoſition in ſoils for taking on the growth and eſtabliſhment of graſs crops, there are other circumſtances to be conſidered in reſtoring them to the ſtate of ſward after they have been under the plough; ſuch as thoſe of their poſſeſſing neither too much or too little moiſture, and that of their having a ſufficient ſtaple or depth of mould for the full and ſecure eſtabliſhment of the graſs plants. As where the ſoils are too wet, or too retentive of moiſture, they will ſuſtain much injury if not be wholly deſtroyed during the winter ſeaſon, when there is much rain and froſt, as well as be quickly ſuperſeded by plants of the coarſe aquatic kind, ſuch as the ruſh, &c. And where they are too dry, the graſſes will be liable to be deſtroyed by heat during the ſummer months, by the little moiſture which they contain being thus carried away, and of courſe leave their places to be ſupplied by other ſorts of coarſe plants, ſuch as thoſe of the moſs, fern, and heath kinds, according to the nature of the ground. A good depth of mould or ſoil is likewiſe requiſite, in order that the roots of the graſs plants may penetrate or run down to ſuch a depth below the ſurface, as to be in a great meaſure out of danger from the effects of heat and evaporation in the ſummer ſeaſon. On this as well as other accounts it is therefore better that the lands intended for graſs, eſpecially where they are to be kept in a permanent ſtate of ſward, ſhould incline in ſome meaſure to a ſtate of moiſture, or be in ſuch a degree retentive of it, as to preſerve that ſtate of humidity which is neceſſary for the healthy and vigorous growth of the plants, without endangering the deſtruction of their roots by putrefaction, from its ſtagnating in too large a proportion about them. It is chiefly on this principle that the more light, thin, dry deſcriptions of ſoil are better ſuited for the production of grain, or the occaſional practice of convertible huſbandry, than for that of permanent graſs.

There are ſtill other circumſtances connected with the nature of the ſoils, which are neceſſary to be particularly attended to in the laying of lands down to the ſtate of graſs, as thoſe of properly adapting the graſs plants to their qualities, ſome ſorts of graſſes being much more impatient of wet than others, conſequently more proper for the drier ſorts of land; ſome more capable of reſiſting the effects of heat and drought, and of courſe more ſuitable for the thinner and more porous kinds of ſoil; while others delight in a moiſt or wet ſoil, and are incapable of being grown with any ſucceſs on ſuch as are of a dry quality. They likewiſe differ much in reſpect to their hardineſs: ſome reſiſting the effects of cold much more effectually than others, of courſe are more adapted to high expoſed ſituations. Beſides theſe, they vary in other reſpects, ſome ſucceeding to the moſt advantage in ſoils of the clayey kind, others in thoſe of a loamy quality, while others delight in thoſe of a ſandy nature;

a few in thoſe of the calcareous kind, and ſome in thoſe which partake much of the nature of peat.

And in addition to theſe different natural propenſities, there are ſome graſſes that have the property of riſing to a great height in the ſtem, and of courſe of affording a large coarſe produce, while others are more limited in this reſpect, but ſpread and extend themſelves more in a lateral direction, affording a leſs proportion of produce, but which is of a finer quality. The former, with certain reſtrictions, would ſeem better adapted to the purpoſe of hay, though the latter may be applied to the ſame uſe, where the fineneſs of quality is preferred to quantity of produce. There are likewiſe ſome ſorts of graſſes that contain much larger proportions of ſaccharine matter in their compoſitions than others, as well as more leaves and fewer flower-ſtems; and which, from the avidity with which they are fed upon by different ſorts of live ſtock, and the ſucceſs that attends their being thus conſumed in the improvement of ſuch ſtock, would appear to poſſeſs the largeſt proportion of nouriſhment; and of courſe to be the moſt proper for being introduced where the lands are intended for the purpoſe of grazing, or fattening animals by means of vegetable food in its graſſy ſtate.

There is another property of graſſes in which they differ conſiderably; and which it is of much conſequence to have regard to in the laying lands to the ſtate of ſward. This is that of early growth, which is a circumſtance of vaſt importance in a grazing point of view, as there is in general a great deficiency of graſs for the ſupport of ſtock in the early part of the ſpring.

It is indeed the opinion of a late intelligent writer*, that in the forming of good meadows, or other graſs-lands, there ſhould be a combination of theſe different circumſtances, as it is chiefly by the firſt, or the quantity of produce, that the cultivator is enabled to ſupport his live ſtock, and pay his rent; of courſe no expenſe in labour or manure is ſpared to obtain it by the prudent farmer. It does not however follow, he ſays, that this ſhould be ſolely regarded, or that to attain it the coarſeſt ſorts of plants ſhould be cultivated; nor will the graſſes that are recommended merely for their being reliſhed by cattle, or for the ſweetneſs of their foliage, if they are found to be deficient in the quantity of produce, fully anſwer the views of the farmer or grazier, as, to conſtitute a good meadow or paſture, an abundant produce is neceſſary. Though animals prefer ſome ſorts of food to others, it is not poſſible to indulge the live ſtock that is to be ſupported conſtantly with the

* Mr. Curtis.

fineſt and moſt delicate hay, or herbage. Beſides, it is not improbable but that the productive graſſes may in ſome caſes be highly nutritious, or that cattle may eat as eagerly the herbage, or hay, made from the coarſe as the fine graſſes. And cattle are frequently known to thrive on food to which they are habituated by neceſſity, though at firſt they could ſcarcely be prevailed on to eat it.

In making experiments, perſons are apt, he conceives, to conclude too haſtily from the appearance which a plant aſſumes on its being firſt planted or ſown; as the moſt inſignificant vegetable will often make a great ſhow, when its fibres have freſh earth to ſhoot into: but the trial comes when the object of the experiment has been in a meadow or paſture ſeveral years, when its fibres, from long growth, are matted together, and it meets with powerful neighbours, to diſpute every inch of ground with it: if it then continue to be productive, it muſt have merit. It is well known, he ſays, that lucern, when left to itſelf, is ſoon overpowered; and if broad-leaved clover, which is undoubtedly a perennial, the firſt year be ſown, a great crop is produced; but let the field be left to itſelf, and the clover, like the lucern, will yearly diminiſh,—not becauſe it is a biennial, as has been often ſuppoſed, but becauſe plants hardier, or more congenial to the ſoil, uſurp its place: this ſhows therefore that at the ſame time that a good plant is introduced, it ſhould be a powerful one, and ſuch as is able to keep poſſeſſion, and continue to be productive.

In reſpect to the property of cattle's thriving on the food they eat, it is unqueſtionably of great conſequence; and it is to be regretted that our knowledge of the moſt nutrient kinds of herbage is ſo confined; but of thoſe plants which have been in cultivation we are enabled to ſpeak with ſome certainty: it is well known that clover, lucern, ſaintfoin, tares, and ſeveral other plants, have a great tendency to fatten cattle; but what natural graſſes, or other plants, which have not been ſubjected to ſeparate culture, have this particular tendency, and in what degrees, remains to be aſcertained by the teſt of experiment. But as leguminous plants are in general found to agree with cattle, it may be reaſonably concluded, he thinks, that a certain quantity of them may be proper and advantageous in paſtures.

It is well known that certain paſtures are more diſpoſed to fatten animals than others; but how far this depends on ſituation, and their particular produce, remains to be aſcertained.

With reſpect to the property of early growth, the want of early herbage in the ſpring is the general complaint of farmers and graziers in all the beſt graſs diſtricts of the kingdom: thoſe plants, therefore, which are found to ſhoot at an

early period, and to put forth early foliage, eſpecially when it is ſuch as is grateful to cattle, muſt be deſerving of great attention. As far as graſſes have to do in this buſineſs, the few mentioned hereafter may, he ſuppoſes, effect all that can be expected in this way: much muſt, however, depend on ſeaſons: if the winter ſhould be ſevere, or north-eaſterly winds prevail in the ſpring months, graſſy herbage will be backward, in ſpite of all that can be done; but in order to counteract the bad effects of ſuch ſeaſons as much as poſſible, paſtures and graſs-lands ſhould, in his opinion, be warmly ſituated, and not drenched too much with moiſture, being ſheltered by thick hedges, and divided into ſmall encloſures. But where early paſturage is the great object of the cultivator, there are other plants that may deſerve a place among them, ſuch as thoſe mentioned below.

And though early herbage is highly valuable for paſturage, it is not leſs ſo for the purpoſes of hay; as by the middle of May at the lateſt, a meadow of this ſort would be fit for cutting; and the ſecond hay-making might begin by the time that hay-making uſually takes place in other caſes; and by this means the double advantage be obtained, of a larger produce, and leſs riſk in ſecuring it.

On the principles that have been already explained, there can be little doubt but that by a judicious and due attention to the different circumſtances and uſes for which graſs-lands are intended, as well as to the ſelecting and mixing of the beſt and moſt proper graſs-ſeeds, and adapting them to the particular nature and circumſtances of the ſoils, after they have been brought into a ſuitable condition for receiving them, thoſe grounds which have been in a ſtate of tillage may be laid down to the ſtate of ſward, in a much better and more beneficial manner than has been the caſe under the indiſcriminate uſe of ſuch as were in, or which have ſown themſelves on the lands from the contiguous paſtures.

It has indeed been long ſince remarked as extraordinary, that cultivators ſhould have neglected to make a proper advantage of plants of ſuch importance, and which, in moſt ſituations, conſtitute the principal food of live ſtock, from the want of properly diſtinguiſhing and ſelecting ſuch as are the moſt advantageous and uſeful under different circumſtances of the land*. Some have likewiſe contended that the beſt graſs-ſeeds cannot be collected at too high a rate, as it is poſſible by ſuch means to render lands, which are ſuited for the production of graſs, much more valuable than can be done by the common modes of laying them down †.

* Stillingfleet's Miſcellaneous Tracts.

† Kent's Hints, and Anderſon's Eſſays, Vol. II.

Much difficulty has without doubt been thrown in the way of introducing the moſt proper ſorts of graſſes, in laying lands down to ſward, from their near reſemblances to each other, in many inſtances, requiring the niceſt diſcernment to diſtinguiſh them, and from the want of other means of procuring them.

It has been lately obſerved by an intelligent botanical writer, that if graſs-lands, ſuch as downs, paſtures, and meadows, be carefully examined, they will all, except ſuch as have been recently laid down with rye graſs or clover, be found much in a ſtate of nature, replete with an indiſcriminate mixture of plants, ſome of which produce cattle-food of a good kind; others, ſuch as is of a very indifferent deſcription; ſome affording good crops, while others ſcarcely yield any at all*. It is therefore

* Curtis's Practical Obſervations on Britiſh Graſſes.

This accurate botaniſt, on procuring ſmall turfs, taken indiſcriminately from different downs and commons in Hampſhire and Suſſex, employed as ſheep-paſtures, found, on their being planted in his garden, that they produced the following ſorts of plants:

Turf from Selborn Common.

Produced Plantago lanceolata. Agroſtis capillaris. Avena flaveſcens. Dactylis glomerata. Feſtuca duriuſcula. Poa annua. Cynoſurus criſtatus. Trifolium repens. Crepis tectorum. Achillea Millefolium. Galium verum. Hypochæris radicata. Hieracium Piloſella. Thymus Serpyllum.

Turf from Oakhanger.

Trifolium repens. Holcus lanatus. Poa annua. Agroſtis capillaris. Agroſtis paluſtris.

Turf from Deortum.

Ranunculus repens. Lolium perenne. Holcus lanatus. Prunella vulgaris. Feſtuca duriuſcula. Agroſtis paluſtris. Trifolium repens. Crepis tectorum. Achillea Millefolium.

Turf from Glynd Hill.

Medicago lupulina. Achillea Millefolium. Poa pratenſis.

Turf from the ſame.

Avena flaveſcens. Feſtuca duriuſcula. Feſtuca ovina. Hieracium Piloſella. Agroſtis capillaris. Trifolium repens. Thymus Serpyllum.

Turf from Short Heath.

Feſtuca bromoides. Aira præcox. Juncus campeſtris. Poa annua. Agroſtis capillaris.

Turf from Mount Cabron.

Rumex Acetoſa. Daucus Carota. Medicago lupulina. Poterium Sanguiſorba. Feſtuca duriuſcula. Avena flaveſcens.

Turf from Ringmer Down.

Linum catharticum. Scabioſa columbaria. Ornithopus perpuſillus. Avena flaveſcens. Feſtuca duriuſcula. Trifolium repens. Hypochæris radicata. Crepis tectorum. Lotus corniculatus. Juncus campeſtris. Hieracium Piloſella. Feſtuca ovina. Thymus Serpyllum. Poa pratenſis.

ſufficiently obvious, that by a careful attention to the procuring of the beſt and moſt ſuitable ſorts of graſs-ſeeds, and applying them according to the principles which have been given above, much ſuperiority may be attained in the forming of paſture or other ſorts of graſs-lands.

Preparation of Land for Graſs Seeds.—This is a part of management that is of vaſt importance to the ſucceſs of forming good graſs-lands, but which has been much neglected in the practice of laying them down. From the ſmallneſs of the ſeeds, and the fibrous nature of the roots of the graſs-plants in moſt caſes, it is evident that lands which are intended for being laid down to the ſtate of ſward, whatever their quality may be in reſpect to ſoil, ſhould conſtantly be brought into as fine a ſtate of pulverization and mellowneſs as poſſible before the ſeeds are put in. As where the contrary is the caſe, from the lumpineſs of the ſurface mould, the ſeeds can neither be ſown with ſo much regularity, vegetate in ſo equal a manner, or extend their roots, and eſtabliſh themſelves at firſt ſo perfectly in the land, they are of courſe more liable to be deſtroyed by hot ſeaſons coming on afterwards. It is probable that in this way much new laid down graſs-land is greatly injured the firſt ſummer, eſpecially when it turns out to be hot and dry. The neceſſary fineneſs of mould may be obtained in different modes, according to the nature of the lands. In the more ſtiff and heavy ones, by ploughing before winter, and

In ſix ſmall turfs, taken from different parts of the uncommonly productive meadow near Saliſbury, mentioned by Stillingfleet, and particularly deſcribed in the firſt volume of the Memoirs of the Bath Agricultural Society, the produce was

In Turf 1.

Poa trivialis. Ranunculus acris. Triticum repens. Agroſtis paluſtris.

In Turf 2.

Poa trivialis. Alopecurus pratenſis. Triticum repens.

In Turf 3.

Poa trivialis. Agroſtis paluſtris.

In Turf 4.

Poa trivialis. Triticum repens. Peucedanum Silaus.

In Turf 5.

Poa trivialis. Alopecurus pratenſis. Agroſtis paluſtris. Avena elatior. Triticum repens.

From this trial it is proved, the writer ſuppoſes, that the great productiveneſs of this meadow did not depend on any new graſs peculiar to it, but on the concurrence of different and unuſual circumſtances, favouring, in an uncommon degree, the growth of certain well-known graſſes, as the *Poa trivialis* and *Agroſtis paluſtris*.

leaving them to be expoſed to the action of froſts and other cauſes during that ſeaſon; having recourſe to ſevere harrowing and occaſional rolling in the early ſpring months; and by the frequent interpoſition of ſuch ſorts of crops, in the courſes that precede thoſe of graſs, as have a tendency, from the peculiar nature of their roots, to looſen and render the ſoils fine; ſuch as thoſe of the bean, cabbage, rape and clover kinds. The lighter ſorts of land may be brought into a proper condition for the reception of graſs-ſeeds, by repeated ploughing and harrowing, or ſcuffling, and the frequent introduction in the previous crops of ſuch ſorts of green fallow crops, as have a power, by the great degree of ſhade and ſtagnation which they afford, as well as by the culture which they require while growing, of bringing the ſoil into a fine friable ſtate. Theſe are turnips, potatoes, tares, ſainfoin, and others of a ſimilar deſcription. It has been obſerved by an intelligent cultivator, that where the graſs-ſeeds are to be put into the ground with grain crops in the ſpring, the tillage ſhould be performed with more than ordinary attention; which, in the caſe of turnips, will depend greatly upon their being conſumed at ſuch an early period as will admit of the ground being thoroughly broken down and reduced; for if there be much delay, and the ſeaſon prove unfavourable, a bed of mould, ſufficiently looſe and mellow, will not be procured for the reception of the ſeeds: and when grown with ſpring corn, the lands ſhould be ploughed over three times: and where the firſt of theſe earths can be given early enough to be influenced by the vernal froſts, it will be found to be much more beneficial*. The uſe of the harrow and the roller will be occaſionally neceſſary after the different ploughings, according to the nature and ſtate of the land. But where the ſowing is executed in Auguſt the ſame degree of attention is not believed by ſome to be ſo neceſſary, as the time and ſeaſon afford ſo full an opportunity of bringing the ground into ſuitable order, that the moſt inattentive cultivator can ſcarcely experience any other difficulty than what originates from an unuſual wetneſs of ſeaſon†.

But beſides this fineneſs of preparation in the ſoils, it is neceſſary that the method of cropping and application of manure in the preceding courſes be ſuch as to leave them in a ſtate of high fertility and richneſs; as no good graſs-land can be ſuppoſed to be produced where the lands have been worn out and exhauſted by the previous crops,—a practice which has, however, been too general in the returning of arable lands to the condition of graſs. Mr. Marſhall has indeed very juſtly obſerved, that the want of proper condition in the lands at the time of their being

* Cloſe in Communications to the Board of Agriculture, Vol. III. † Rev. A. Young in Ibid.

laid down to ſward, added to thoſe of improper ſorts of graſſes and bad ſeeds, is the chief cauſe of their not ſucceeding. According to ſome, manure ought to be applied with every other crop, and always with that which immediately precedes the graſs. This is a practice that ſhould be adopted as much as poſſible.

In order to have graſs-lands of the beſt kind, it is likewiſe of great utility to have them ſo managed in the preparation, as to be rendered perfectly clear and free from all ſorts of weeds, as by their riſing with greater rapidity than the ſown graſs-plants, they are often liable to ſhade and deſtroy them, or greatly injure their growth.

It has been adviſed by an experienced cultivator, in reſtoring old worn-out lands to the ſtate of good paſture, to clear the land from injurious weeds by means of a full winter and ſummer fallowing, or inſtead of the latter, by a crop of potatoes well manured for, and kept in a perfectly clean ſtate by attentive culture while growing, ſucceeded by winter vetches fed off in the early ſpring*. In all the more light ſorts of ſoil, it is unqueſtionably the moſt beneficial practice to bring the ground into that ſort of fine tilth, which is proper for the reception of graſs-ſeeds, by a judicious mixture of green crops of different ſorts with thoſe of the corn kind, according to the nature of the ſoil. The moſt appropriate methods of intermixing theſe with each other have been already explained†.

When the lands have been by theſe methods brought into a good ſtate of fertility, and reduced into a ſufficiently mellow and friable condition of mould, the ſurface ſhould be made as fine, looſe, and even as poſſible. Where the grounds are much inclined to moiſture, the ridges may be preſerved, which ſhould be of conſiderable breadths with very ſlight furrows; but in the more light and porous deſcriptions of land, the whole ſhould be laid as even as poſſible without any ridges or furrows. In the former caſes, in ſome diſtricts they prefer making the ridges ſix, eight, or more yards in breadth, which when the land is to be under the ſcythe is in a much better ſtate for being mown, and if for paſture there will be leſs danger of the animals being injured by being caſt in the furrows. And in the latter the ſurface will not only be more agreeable in its appearance, but be more advantageous for all the purpoſes of graſs management afterwards‡.

Proper kinds of Natural Graſſes.—The circumſtances that have been already obſerved, render it ſufficiently evident that the proper choice and application of graſſes muſt be a matter of great conſequence in the laying down lands to the ſtate of ſward.

* Billingſley's Corrected Report of Somerſetſhire.

† Rotation of Crops in Section on Cultivation of Arable Land.

‡ Corrected Agricultural Report of Lancaſhire.

But it is obviouſly a buſineſs attended with uncommon difficulty, from the number of trials that have been yet made, being very inadequate for affording the means of fully deciding upon their properties, advantages, and uſes, in many caſes, as well as from their habits, and the ſoils to which they are the beſt ſuited, being often very imperfectly known; and alſo from the great trouble and inconvenience of obtaining their ſeeds genuine, and in a proper ſtate for the purpoſes of healthy vegetation. The graſs plants of the natural kind which have been found by experienced cultivators moſt uſeful and beneficial in the different views that have been before ſuggeſted are: the Sweet-ſcented Vernal Graſs; Meadow Fox-tail Graſs; Smooth-ſtalked Meadow Graſs; Rough-ſtalked Meadow Graſs; Meadow Feſcue Graſs; Sheep Feſcue Graſs; Hard Feſcue Graſs; Tall Feſcue Graſs; Creſted Dog's-tail Graſs; Ray or Rye Graſs; Yorkſhire White; Cock's-foot Graſs; Tall Oat Graſs; Timothy Graſs; Yarrow; Burnet; White Clover; Trefoil; Cow Graſs; Rib Graſs; and a few others which will be deſcribed below.

Moſt of theſe different ſorts of graſſes will be found uſeful in laying lands under different circumſtances of ſoil, ſituation, and moiſture, or dryneſs, to the ſtate of ſward.

Sweet-ſcented Vernal Graſs.*—This is a ſort of graſs that comes early into bloſſom: it is of courſe valuable as an early graſs, and it is alſo valuable for its readineſs to grow in moſt kinds of ſoil and ſituation, being found in bogs, in woods of low growth, or which have had the underwood removed, in rich meadows, and in dry paſtures; but in point of crop it is not ſo productive as ſome, yet more ſo than others: cattle are ſaid to be fond of it, and it is well known to be the only graſs of this climate which is odoriferous; the agreeable ſcent of new-made hay being produced almoſt entirely by it; and the green leaves, when bruiſed, readily impart this odour to the fingers, by which means the foliage may conſtantly be known; and it may be readily diſtinguiſhed when in bloſſom, by its having only two threads or ſtamina to each flower. But it is leſs productive in point of ſeed than many of the other graſſes. In certain ſituations, eſpecially in dry ſeaſons, its leaves are apt to be blighted, from a diſeaſe which changes them to an orange hue, and which has proved highly injurious to the plants when in a cultivated ſtate †.

From conſtantly flowering in hard ſtocked paſture-lands, ſome ſuppoſe that it is not much reliſhed by cattle in common. In a ſlight proportion, as that of one-eighth, it may however anſwer well ‡. It thrives well on poor ſandy ſoils.

* *Antoxanthum odoratum.* † Curtis's Practical Obſervations. ‡ Sole in Bath Papers, Vol. IX.

SWEET SCENTED VERNAL GRASS.

(Anthoxanthum odoratum.)

MEADOW FOXTAIL GRASS.

(Alopecurus pratensis.)

*Meadow Fox-tail Graſs**.—Is a ſort of graſs that ſends forth its ſpike almoſt as ſoon, and in ſome ſituations full as early, as the Sweet-ſcented Vernal: conſequently it is equally valuable as an early graſs; and as it is much larger and quicker in its growth, it is of courſe much more productive: it ſhoots very rapidly after mowing, producing a very plentiful aftermath: and where the land is rich, and two crops are not thought too much for it to bear, of all the graſſes of this climate it appears to be the moſt adapted for ſuch a purpoſe, and ought to form a principal part of the crop in ſuch caſes. Its foliage may ſeem coarſe to ſome; but it muſt be kept in mind that no graſs can be productive that is not in ſome degree coarſe. If it be mown early, juſt as it comes into bloom, though the leaves are large, the hay will not, however, be coarſe. In general, the great advantage proceeding from the earlineſs of theſe two graſſes is entirely loſt in thoſe diſtricts where hay-making begins at a late period, and where a crop of indiſcriminate herbage is waited for by the cultivator.

It is in ſome meaſure diſtinguiſhed by the largeneſs of its foliage, and by its producing a ſoft ſpike on a long ſtalk about the beginning of May. This is a great objection to it, as the ſeed cannot be always obtained in plenty†. On a ſituation where it was perfectly eſtabliſhed with thick herbage it was found to produce but few ſeed-ſtems‡.

In reſpect to the places of its growth, it is more confined than the firſt ſort, growing naturally in a moiſt ſoil only: on this account ſome think it beſt adapted for improving ſuch wet grounds as may be drained of their ſuperfluous moiſture, or for forming or meliorating meadows that have a moiſt bottom, and are not apt to be burnt up in dry ſummer ſeaſons§. Others, however, ſuppoſe that there is ſcarcely a better graſs for moiſt loams and clays, as it is extremely early; and abides nine or ten years on ſoils upon which the Meadow Feſcue gives way to thoſe of other kinds‖. It has likewiſe by ſome been found hardier againſt froſt and exceſſive cold¶. Others ſpeak of it as excellent, both for paſture and hay, as being highly productive, and the firſt as a dairy graſs**. The ſeeds are eaſily collected, according to the accounts of ſome accurate obſervers††; but a great number of them, in certain ſeaſons, are liable to be deſtroyed by a very minute orange-coloured *larva*, or maggot, which feeds on the embryo of the ſeed, and moſt probably produces ſome ſmall ſpecies of fly‡‡.

* *Alopecurus pratenſis.* † Young in Communications, &c. Vol. III. ‡ Ibid.
§ Curtis's Obſervations. ‖ Young in Communications to the Board of Agriculture, Vol. III.
¶ Mr. Majendie. ** Sole in Bath Papers, Vol. IX.
†† Martyn's *Flora Ruſtica*, Vol. I. and Curtis's Obſervations. ‡‡ Ibid.

*Great or Smooth-ſtalked Meadow Graſs**.—In this graſs the foliage alſo begins to ſhoot and to aſſume a beautiful verdure at an early period in the ſpring; but the flowering ſtems are not produced ſo ſoon, by a week at leaſt, as thoſe of the laſt: this ſlight difference, in point of earlineſs of flowering, does not, however, prevent it from being properly ranked with the two preceding graſſes. Where early graſſy paſturage is the great object of the cultivator, it cannot probably be better obtained than by a judicious combination of theſe three graſſes. If quantity of crop be at the ſame time in view, the Meadow Fox-tail Graſs ſhould predominate in a conſiderable degree †.

It in ſome meaſure affects a rather dry than a moiſt ſituation, on which account it keeps its verdure in long-continued dry ſeaſons better than moſt other ſorts; but it is capable of thriving in either pretty well, though more luxuriantly in rich meadows. It is liable to ſome objection from its creeping root, which when eſtabliſhed is difficult to extirpate: it ſhould of courſe be cautiouſly introduced where the land is not intended to remain in a permanent ſtate of ſward ‡.

By ſome it is conſidered, however, as a highly valuable graſs, as all animals are fond of it; and it affords the beſt hay, as well as the richeſt paſturage. In addition to its other qualities, it has the property of abiding continually in the ſame ground, while moſt other ſorts are liable to change §. On rich loams it has been found, by ſome, a highly valuable graſs, ſucceeding well with different cultivators ‖.

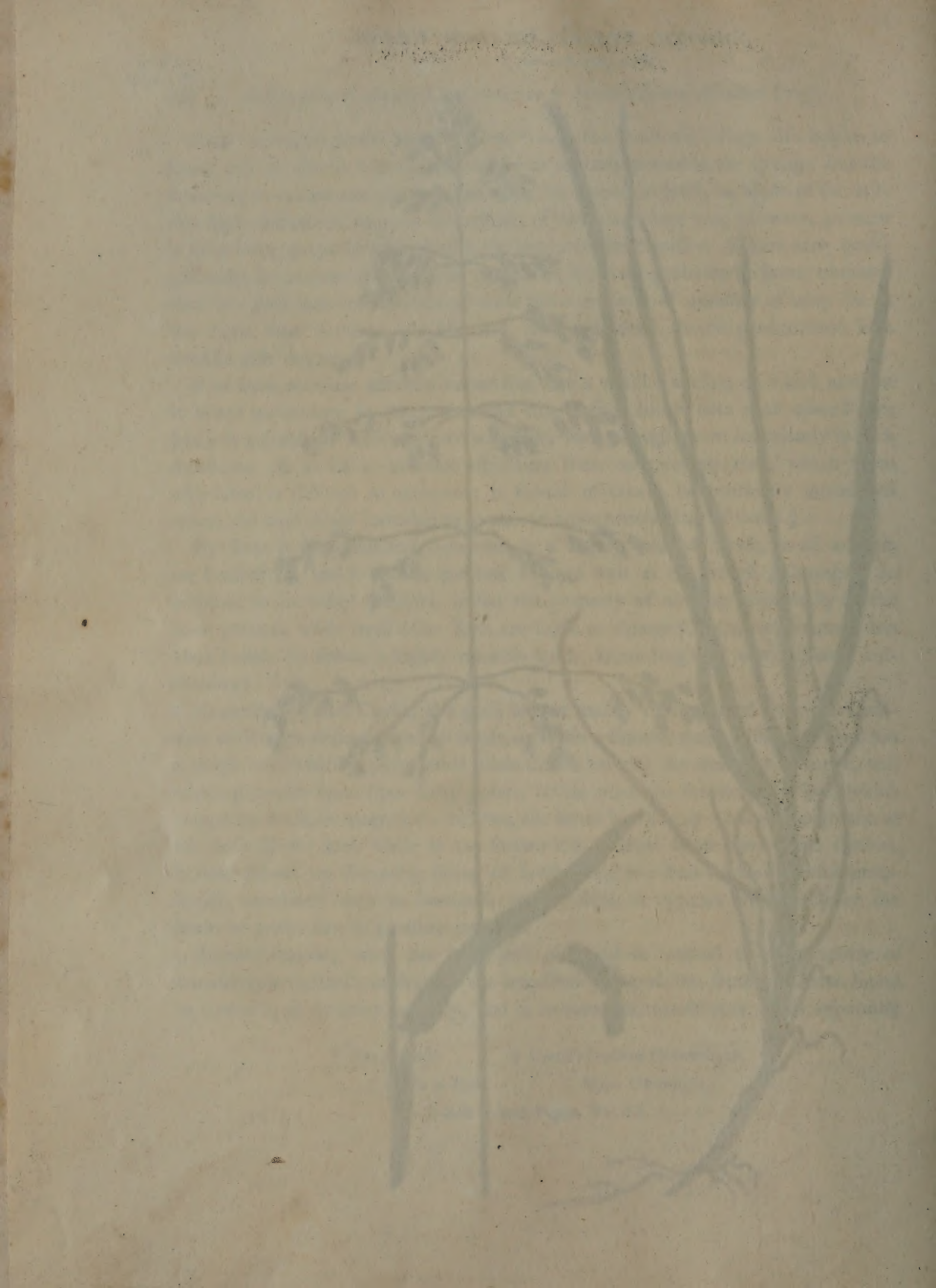
According to Mr. Curtis, this graſs is now readily diſtinguiſhed from the Common or Rough-ſtalked Meadow Graſs, as it has a ſmooth ſtalk, while the other has a rough one, which is perceptible when drawn betwixt the thumb and finger, and which proceeds from little ſharp points, viſible when the ſheath of the leaf, which covers the ſtalk, is magnified: beſides, the latter has a long pointed membrane at the baſe of the leaf, while in the former it is a ſhort blunt one. And further, it only throws up flowering-ſtems or bents once in a ſeaſon; from which peculiarity, combined with its hardineſs and verdure, it appears well ſuited for the lawns or graſs-plats of pleaſure-grounds.

Notwithſtanding what has been juſt obſerved in regard to its property of remaining in the land; in dry ſoils the crop from this graſs has ſometimes been found to diminiſh in quantity annually, and to become ultimately very ſmall, eſpecially

* *Poa pratenſis.* † Curtis's Practical Obſervations.
‡ Curtis in Ibid. § Major Cartwright.
‖ Sole in Bath Papers, Vol. IX.

SMOOTH STALK'D MEADOW GRASS.

(Poa pratensis.)



MEADOW FESCUE GRASS.

(Festuca pratensis.)

MEADOW FESCUE GRASS

ROUGH STALKD MEADOW GRASS.

(Poa trivialis.)

when the roots have become matted, and exhauſted the ground, which they ſeem much diſpoſed to do; but in moiſt meadows this effect has not been ſo much noticed *.

Common or Rough-ſtalked Meadow Graſs †.—Though this graſs has much ſimilarity to the preceding in its appearance, eſpecially in the mode of flowering, it differs eſſentially in its qualities, as the former is chiefly found in dry paſtures, while the latter principally occurs in moiſt meadows. It delights in moiſture, and ſituations that are ſheltered; on which account, though there are few more productive, or better adapted for the purpoſe of hay or paſturage, it is tender, and liable to be injured by ſevere cold or drought: and in moiſt rich ground it has been obſerved to grow tall, while in poor land it has been found equally diminutive.

It is ſaid by ſome cultivators to be a graſs well adapted to good, ſound, moiſt loams. On the continent it is greatly eſteemed both for dry paſtures and water meadows, as it multiplies much by ſeed as well as root. It is therefore neceſſary to permit the ſeeds to fall, in order to preſerve the quantity undiminiſhed. The produce is admirable for the feeding of all ſorts of cattle ‡. It is, however, conſidered by ſome as inferior to the laſt ſort, from its property of going off after being cut, being ſupplanted by thoſe of the bent kind: but its radical as well as ſtem-leaves grow larger §.

As the ſeeds of this as well as thoſe of the laſt ſort are apt to be entangled, and adhere to each other, it is difficult to diſperſe them evenly in ſowing. This circumſtance ſhould therefore be attended to in putting them into the land.

Meadow Feſcue Graſs ‖.—This is a graſs that comes near in its appearance to Ray Graſs, but to which it ſeems greatly ſuperior, at leaſt for the purpoſe of forming or improving meadows; as being larger, and more productive of foliage. It is ſtrictly perennial and hardy, thriving well not only in wet but in dry grounds; growing in all ſituations, from the ſand-pits at Charlton to the oſier-grounds at Batterſea; and it abounds in the beſt meadows, in the beſt hay diſtricts: in ſhort, it ſeems well calculated to ſupply the defects of Ray Graſs. Beſides, it has the quality of producing more ſeeds than moſt of the other ſorts of graſſes, which are eaſily gathered, and grow readily. It is however inferior to the three firſt of the above graſſes in one property, which is, that it does not produce its flowering-ſtems ſooner than about

* Curtis's Obſervations. † *Poa trivialis.*

‡ Young in Communications to the Board, &c. Vol. III. § Sole in Bath Papers.

‖ *Feſtuca pratenſis.*

the middle of June, which is a fortnight or three weeks later than the ſecond of them; though it cannot be conſidered as a late graſs, as thoſe of the bent and ſome other ſorts flower later by three weeks or more*.

Sheep's Feſcue†.—This graſs has been much praiſed by ſome, both for the purpoſes of paſture and hay; ſheep and other ſorts of live ſtock being very fond of it, and ſoon rendered fat in paſtures where it prevails. But from its affording in dry heathy expoſed ſituations, and commons, but a very ſmall produce, and its foliage being hard and wiry, as well as from its appearance in dry ſummers being unpleaſantly brown; and in rich moiſt ones, where the foliage retains its verdure, and becomes much taller; from its being in its nature a ſmall plant, it cannot be productive, conſequently cannot be conſidered as in any way fit for a hay graſs‡. It is ſaid by ſome to be capable of thriving on any ſoil, but beſt on thoſe of the light ſpongy kinds, as it can live with leſs moiſture than moſt other graſſes. And it is aſſerted to be one of the excellencies of this graſs, that it will eſtabliſh itſelf upon ſuch ſoils as ſcarcely any other plant can be made to ſucceed on; being of courſe of much utility in covering barren ſpots, that might otherwiſe have remained uncovered for a great length of time §.

Others however obſerve, that if it were ſown on rich moiſt ſoils, the graſſes and other plants, which are natural to ſuch lands and ſituations, would ſoon overpower it, and in a very ſhort time there would ſcarcely be a blade remaining to be ſeen on the ground. And were it for the purpoſe of ſheep feed to be ſown on the high down and heath lands, the animals would ſtarve upon them in dry ſummer ſeaſons ‖. Where a cloſe matted turf, without a great produce, is required, it may, however, be found uſeful.

Hard Feſcue¶.—This is an early and productive graſs, with fine foliage, which grows well on downs and rich meadows. It is well adapted for being combined with other graſſes in forming ſheep paſtures**; and by ſome it is ſaid to conſtitute the beſt hay.

Creſted Dog's-tail Graſs††.—This is a graſs that has been much recommended as a favourite and wholeſome food for ſheep. It is found in the ſoundeſt and beſt paſtures, but grows beſt in dry ſituations, and will not thrive in meadows that are very moiſt. It flowers nearly at the ſame time as the Meadow Feſcue Graſs, but is not very productive of foliage‡‡. The appearance of its bents in poor, high,

* Curtis's Obſervations.

† *Feſtuca ovina.* ‡ Anderſon's Eſſays, Vol. II. § Curtis's Obſervations, &c.

‖ Curtis's Obſervations. ¶ *Feſtuca duriuſcula.* ** Sole in Bath Papers, Vol. IX.

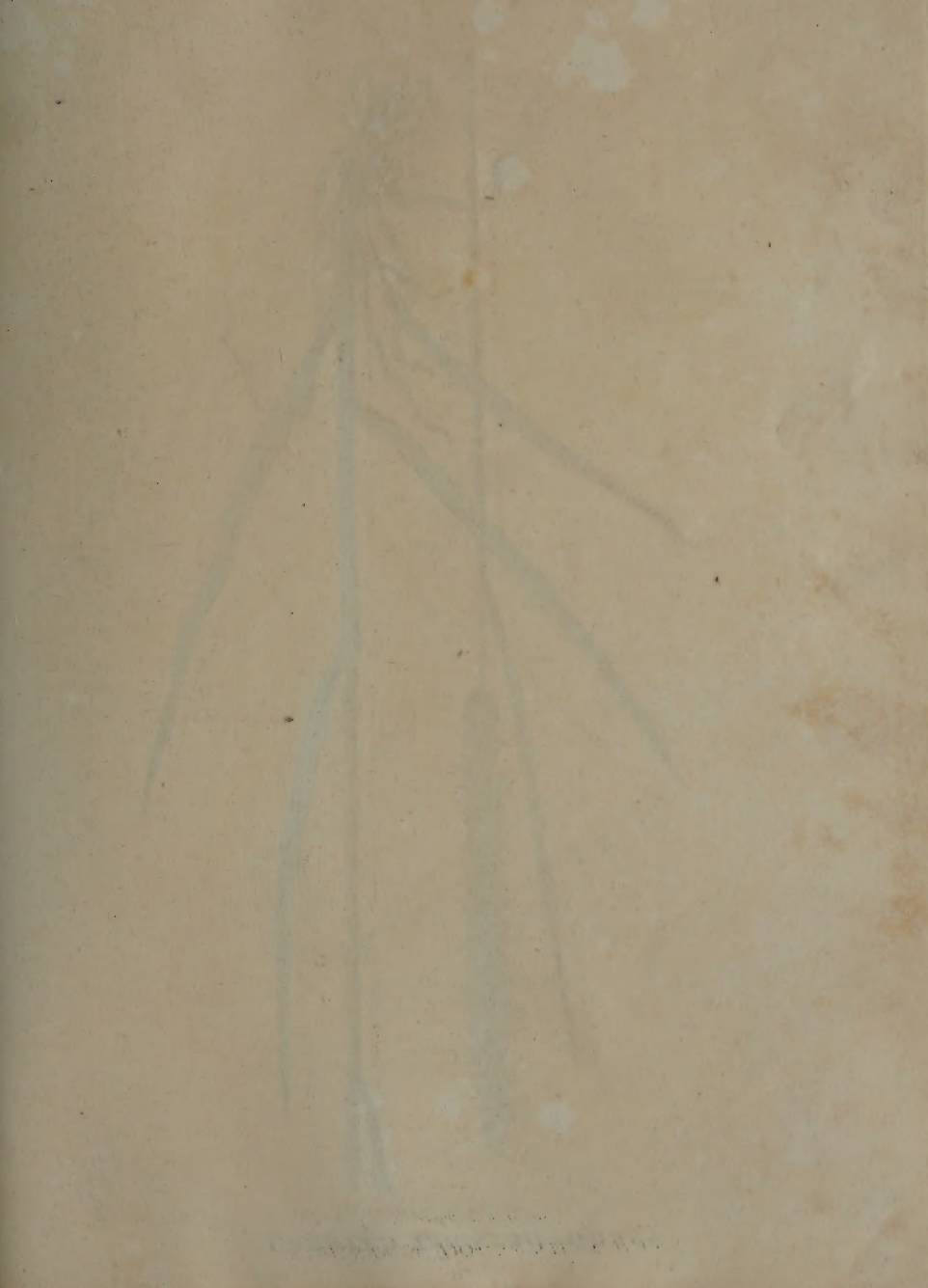
†† *Cynoſurus criſtatus.* ‡‡ Ibid.

SHEEPS FESCUE GRASS.

(Festuca ovina.)

CRESTED DOGSTAIL GRASS.

(Cynosurus cristatus.)



COMMON RAY GRASS.

(*Lolium perenne.*)

moiſt paſtures, ſuggeſts the idea of its being an indifferent plant. But its abounding in moſt of the richeſt grazing paſtures in different parts of the kingdom, and its being in ſome the principal herbage, leads us to conclude that it is an uſeful graſs *. As its flowering ſtems and heads are ſeldom conſumed by cattle, its ſeeds may be collected, where the paſtures are fed, with great facility; and, as they are abundant, may be gathered by children at about one ſhilling the pound.

Land may be laid down with it in a ſucceſsful manner, if proper attention be beſtowed in having the ſeed collected when fully ripe, as it has been known to fail on this account †. On the continent it is in high eſtimation as a paſture graſs ‡. From the fibrous nature of its roots, not admitting the running down much into the ſoil, there may be danger of its being deſtroyed in dry ſummer ſeaſons.

As it abounds greatly in the beſt paſtures, and is a blade graſs that ſhoots up the firſt after the land has been mown, its thickeſt tufts are ſaid to afford much food for ſheep in the time of ſnow and ſevere weather in the winter ſeaſon. Thoſe who are not accuſtomed to diſtinguiſh the difference of graſſes with much accuracy, may, it is obſerved, deſpiſe it, as of an improper and uſeleſs kind; but the ſheep and the ox, who muſt be allowed better judges, will ſoon convince them of its importance. From the rapidity of its growth it may be apt to get coarſe, if not cut down more quickly than is often the caſe. The ſeed is ſmall and fine, but may be obtained with much facility by paſſing the ſtem in a tight manner through the hand. It has been procured at ſixpence the quart §.

Ray or Rye Graſs ‖.—This is a ſort of graſs that has been much in cultivation, but is deficient in ſome of the properties neceſſary for meadow or paſture lands. The objection on the ſcore of its producing little more than flower-ſtems or bents, is ſaid to be only found valid when it grows in upland paſtures and dry ſituations: in rich moiſt meadows its foliage is more abundant; and it ſeems probable that it is highly acceptable and nutritious in feeding cattle: its foliage is of rapid growth, the flowering ſtems continually ſhooting forth ¶. It is, however, a graſs that varies greatly, according to ſituation and circumſtances.

It is beſt adapted to the loamy and ſandy deſcriptions of ſoils; but it will ſucceed on any except ſtiff clay, and even on that it may be grown. On the richer

* Young in Communications, &c. Vol. III. and Marſhall's Rural Economy. † Ibid.
‡ Atti di Milano, var. loc. § Goring in Communications to the Board of Agriculture, Vol. III.
‖ *Lolium perenne.* ¶ Curtis's Obſervations.

ſorts of the two firſt kinds of land, it frequently turns out both a good vernal and permanent paſture graſs when employed in due mixture with other ſorts; and it is particularly ſuited to be fed by ſheep*. It is not, however, ſo early as ſome of the graſſes that have been deſcribed above.

Some of the varieties of this graſs, as thoſe cultivated by Mr. Peacey, are ſaid to be much ſuperior to the common kind, by thoſe who have had great experience of them.

Some cultivators ſuppoſe the reaſon of its not producing a thick well-connected ſward in ſome ſituations is, that it is only ſuited to lands that are in a rich and fertile condition, though it may be occaſionally found in thoſe of the contrary kind. It is, indeed, well obſerved by an intelligent writer, that "when land is in a proper ſtate of manure, ray-graſs, united with white clover, will form a perfect ſward the latter end of the ſecond year after it is ſown. A particular field, of about five acres, that was ſown with theſe two graſſes only, was more perfectly graſſed over than others, which had the addition of trefoil and rib graſs, and which were ſown at the ſame time. A neighbour of his, the only man in the country that had tried ray-graſs, told him it would not anſwer, and referred him to a particular field where ſome had been ſown. The fact was, that he had cropped this field with oats, until it was no longer worth ploughing; and then, with his laſt ſeed, he ſowed ray-graſs, which certainly did not flouriſh. But his argument would have been equally concluſive againſt any graſs or grain whatever. The ray-graſs languiſhed, and, finally, died away, giving place to the vegetation ſuited to the ſtate of the land. If it be expected that ray-graſs, or any other good graſs, ſhould thrive and produce abundant crops on exhauſted or poor land, it muſt not he ſays be in the ſoil which occurs here†.

The following remarks of the ſame author are deſerving of the notice of the cultivator: "On converting ray-graſs into hay, it is neceſſary he ſays to cut it at a period previous to its being ſo ripe as to have perfected its ſeed, and changed to a yellow colour; for in this caſe a great part of the juices of the plant, which conſtitute a principal part of the nutriment it is to afford, will be converted into a ſpecies of ſtraw, and its nutritive properties be proportionably diminiſhed. When it is made into hay, perſons not acquainted with its qualities are apt to object to its apparent coarſeneſs, which proceeds from its conſiſting

* Young in Communications to the Board, &c. Vol. III.

† Campbell in Communications to the Board, &c. Vol. III.

almost entirely of flowering-stems, the ray-grass having a comparatively smaller proportion of leaves than any other grass. Whether this be a defect or a merit, will, he thinks, depend upon a solution of this question: Do the stems and flowering parts of grass, or the leaves, taken weight for weight, contain the greater proportion of nutriment? It does not appear that this has been determined by experiments instituted for the purpose; but it seems probable, from the stems being so much sweeter than the leaves, (which is particularly perceptible upon chewing them when about half dry,) and from those vegetables which contain much saccharine matter being particularly nutritious, that the greater proportionate quantity of nutriment will be found to reside in the stalks; and if so, the advantages of ray-grass will be decisive. But, however this may be, it is certain that, supposing wet weather comes on during the process of hay-making, the first part of the grass that decays is the leaf, which soon becomes yellow, and then black, losing all pretensions to nutritive properties; in which case, it is evident that almost the whole nutriment contained in the hay must reside, exclusively, in the flowering-stalks. Ray-grass then has, in unfavourable hay seasons, an advantage over all others, inasmuch as, from having fewer leaves, it is not so apt to be injured by a continuance of rain: and it is besides, when in the cocks, more accessible to the air and wind, from lying more open and light; and consequently not so apt to heat and mould as other grasses in similar situations and seasons."

On the whole, he conceives that "it certainly possesses the following valuable properties: 1. That there are few grasses so early in the spring. 2. That there are none better relished by cattle, or more nutritive. 3. That it has the power of resisting the effects of bad weather, in ticklish hay seasons, in a greater degree than other grasses. 4. That there is a greater facility in collecting its seed than of any other grass."

It is conceived that the prejudices against it have arisen, 1. "From its having been sown in land not capable of producing a full crop of any good vegetable. 2. From allowing it to shoot up so far as to have formed the seed in the flowering-stalk, before cattle have been turned into pasture, or that it has been cut for hay. Ray-grass appears to partake more of the nature of grain than any other grass. Hence, when it has perfected its seeds, it shoots out no more stalks, and but few leaves that season, as lord Kaimes has justly observed. Hence it is necessary to turn cattle into a field of this grass early in the spring, and to keep it well under by a sufficient quantity of stock; in which case it will continue to put out fresh flowering stalks and leaves during the whole season. 3. The hay, for the reasons

juſt aſſigned, ſhould be cut before it becomes a mere ſtraw. Common hay graſs, being compoſed of graſſes in various ſtages of growth and ripeneſs, admits of a greater latitude than a field of ray-graſs, becauſe many of them will generally be in a proper ſtate for cutting, although others may have paſſed their prime."

The following facts, adduced by this accurate obſerver, fully eſtabliſh its nutritive properties: "No hay he ſays could be better reliſhed by his horſes than this was; not a particle of it was waſted by them, or left in the rack; no animals could thrive, coat, or do their work better than they did, whilſt they had this ray graſs hay to take to. Never was there a greater contraſt than when they were put to the natural hay graſs of the country after they had finiſhed the other. They were literally ſtarved into the eating it; and in ſpite of an additional quantity of corn they fell away, (agreeably to his farming man's mode of expreſſion) a limb a-piece. This year nothing can look better than his horſes do upon this hay, (with which ſome red clover is mixed,) and this, with the addition of very little corn, and that moſtly light, the tailings of oats and barley."

Meadow Soft Graſs, or *Yorkſhire White**.—It is common in meadows and paſtures, and is hardy and productive of foliage, but flowers much later than the firſt of the above graſſes: its foliage is ſoft and woolly†. It thrives beſt on ſoils of the more moiſt kinds; but may be grown on almoſt any that are not very dry and in poor condition; and even on theſe it is ſometimes met with. By ſome cultivators it is chiefly adviſed to be made uſe of with a view to ſheep paſture, as it has not been found equally good for other ſorts of ſtock. And it has been found to anſwer beſt when kept very cloſely fed‡. It has been ſuppoſed uſeful for neat cattle, but very indifferent for horſes§.

It grows in a quick manner, and affords good ſheep-feed in the winter ſeaſon; and would ſeem, from the following fact, to be much reliſhed by live ſtock: on two fields being laid down adjoining each other, one with this graſs, and the other with rye-graſs (*Lolium perenne,*) the former was eaten much cloſer than the latter, by the ſtock turned upon them‖.

Rough Cock's-foot Graſs¶.—This is a coarſe, rough graſs, but very hardy and

* *Holcus lanatus.*

† Curtis's Practical Obſervations.

‡ Young in Communications to the Board, &c. Vol. III.

§ Marſhall's Rural Economy of the Midland Counties.

‖ Goring in Communications to the Board, &c. Vol. I.

¶ *Dactylis glomerata.*

ROUGH COCKS FOOT GRASS.

(Dactylus glomeratus.)

productive. It is common in meadows; and rather early*. Some condemn it as not only an indifferent graſs, but one that is often rejected by cattle †. Others, however, on the authority of experience, conſider it as highly valuable on moiſt loams where the bottom is of a clayey marl nature; and in caſes where the graſſes of a finer kind are liable to be overpowered and deſtroyed by thoſe plants that are common to the ſoil. When it is kept very cloſely fed down, it conſtitutes excellent paſturage for ſheep; but when this is neglected, like many other graſſes, it gets coarſe: if ſown with red clover, in the proportion of two buſhels of the graſs ſeeds to ten pounds of the clover, it forms a better ſward; for, as the latter wears out or diſappears, the former reſumes its place, and laſts better in the land. It is a graſs that vegetates better during the winter ſeaſon than many others ‡. It affords much ſeed, and which may be gathered at but little expenſe, as about four ſhillings the buſhel §. It has been found highly beneficial in affording an early ſeed for ſheep ‖.

Tall Oat Graſs ¶.—This is a graſs ſometimes found abundantly in meadows. It is early, coarſe, and productive; but affords a plentiful aftermath. In excellence it approaches the meadow fox-tail, for which it may, in many caſes, prove no indifferent ſubſtitute **. It is cultivated on the continent with advantage ††.

This, like the preceding graſs, is found the moſt beneficial when retained in a cloſe ſtate of feeding ‡‡. It makes good hay, and experiment has ſhown it to afford a greater weight of produce than moſt other graſſes §§. On the continent, in compariſon with common graſs, it is found to yield in the proportion of twenty to two ‖‖.

Meadow Cat's-Tail Graſs, or *Timothy* ¶¶.—This graſs ſucceeds beſt in moiſt ſoils and ſituations, is very productive, but coarſe and late. It poſſeſſes no advantages over the meadow fox-tail ┼. It is the moſt proper for clays, the moiſter kinds of loams, and thoſe of the peat nature. When cultivated on moiſt loams with a ſubſtratum of the clayey marl deſcription, it has been found on trial very uſeful, eſpecially when kept cloſely fed down by ſheep ╠. According to the accounts of travellers in America,

* Curtis's Obſervations, &c. † Sole in Bath Papers, Vol. IX.
‡ Young in Communications to the Board, &c. Vol. III. § Ibid.
‖ Young's Eaſtern Tour, Vol. I. ¶ *Avena elatior.* ** Curtis's Practical Obſervations.
†† Annals of Agriculture. ‡‡ Young in Communications, &c. Vol. III.
§§ Swayne's *Gramina Paſcua*, Fol. edit. ‖‖ Obſ. Soc. de Bretagne pour l'Année 1759.
¶¶ *Phleum pratenſe.* ┼ Curtis's Practical Obſervations.
╠ Young in Communications, &c.

it conſtitutes the principal ſupport of cattle and other animals, wherever the lands are of the meadow kind. It affords plenty of ſeed, of which a buſhel is ſaid by ſome to be ſufficient, when mixed with thoſe of other ſorts, to ſow four or five acres of land. They are capable of being procured in a perfectly clean ſtate from America, in any proportion, at the eaſy expenſe of about a guinea the buſhel*.

Hay-Seeds.—Theſe are the ſeeds collected in hay-lofts and chambers, or from under the ſtacks; and muſt of courſe be a mixture of the ſeeds of various ſorts of graſſes, both good and bad, as well as of other ſorts of plants that may have been upon the land from which the hay was taken. They ſhould conſequently never be indiſcriminately made uſe of in laying down lands to the ſtate of ſward, as has been the too common practice. The only way in which they can be uſed with propriety is, by ſelecting them from the beſt graſſes on the fields after their being cut down, and afterwards threſhing them out, as by this means the ſeeds of the bad and improper plants may avoid being mixed and blended with thoſe that are valuable and of the proper ſorts. Another method has been adviſed by an able practical cultivator, which is that of taking them from ſuch old paſture meadow, or marſh lands, as abound in graſſes of the beſt kinds; being careful that the ſoils from which they are taken be ſimilar to thoſe on which they are to be ſown; and inſtead of cutting them at the common period of hay-time, to let them ſtand till the yellow oat graſs begins to turn its colour, which being one of the lateſt kinds, all the others will have attained perfection: they ſhould then be cut down, and afterwards threſhed out on a cloth in the field, or ſecured to be threſhed in the winter ſeaſon †. But in this way, with the greateſt care, improper and uſeleſs plants may often be propagated.

There are other plants beſides theſe that may be of great advantage in laying down lands to graſs, by the large quantity of herbage they produce, ſuch as the following:

Yarrow ‡.—This is a plant that ſends forth a great abundance of leaves, which conſtitute good herbage, and which are conſumed with great avidity by cattle and ſheep; but from the flower-ſtems being ſometimes rejected, it has been too much neglected. It forms the principal herbage in many fine rich paſtures; but where they are kept cloſely fed down is but little perceived §. It is predominant on moiſt, loamy ſoils, in nearly an equal degree as on thoſe of the dry, burning, ſandy, gravelly, or chalky kinds. It is of much utility in reſiſting the effects of drought in the moſt dry, parched, cloſe-fed lands; often preſerving the ſpots where it prevails in a green ſtate, while others are burnt up and become quite brown. It is ſaid to

* Young in Communications, &c. † Boys in Communications to the Board of Agriculture, Vol. III.

‡ *Achillæa Millefolium.* § Anderſon's Eſſays.

DUTCH OR WHITE CLOVER.

(Trifolium repens.)

anſwer well, when cultivated with a view to be fed by ſheep. It is therefore a plant of much value, and which deſerves greater attention than has hitherto been beſtowed upon it*. The ſeeds may be collected in October, without much difficulty, and at the rate of about five ſhillings the buſhel†.

White Clover ‡.—This has been greatly depended upon by moſt cultivators, in bringing lands into a ſtate of ſward. It is an extremely uſeful plant on the more rich and dry, ſandy and loamy ſoils, as well as in the clayey and peaty deſcriptions of land, where they have been well drained from moiſture: but on the more wet and poorer ſorts of loamy and clayey lands, it is not by any means ſo proper or uſeful, as it is not laſting, but gives place to plants of the aquatic kind, as well as others of an indifferent deſcription. It is ſuppoſed by ſome not to afford ſo ſweet an herbage as broad clover or many other plants: with us it has, however, always been eagerly fed upon both by ſheep and neat cattle; and where cloſely fed down, we have little doubt of its great utility. That which comes up naturally by the application of manure is ſaid to be much more hardy than that which is ſown, as well as more laſting in the ſoil §. It has been juſtly remarked as a proof of good land, that it runs quickly, of its own accord, to this plant ‖. It may be introduced with moſt ſorts of ſeeds, and contribute greatly to the ſucceſs of the cultivator.

Cow-Graſs ¶.—This is uſually known to farmers, under the title of Marl Graſs. It is ſaid to be a more laſting plant than the common red clover. On clayey ſoils and loamy ones of the ſtronger kind, it is found to ſucceed to the greateſt certainty**. And its cultivation has been attempted on thoſe of the ſandy deſcription, with ſuch ſucceſs as to afford good crops††. The ſeed can always be procured with facility.

It is ſaid to ſucceed well on all the heavier ſorts of ſoil, and to be of great utility when ſown with other graſſes, where the lands are to remain in the ſtate of graſs ‡‡. It is recommended to be ſown on the ſtone-braſh lands, in large proportions, with other ſorts of clover, by an intelligent cultivator §§.

Trefoil ‖‖.—This is another plant which is capable of ſucceeding on ſoils of different

* Young in Communications, &c. Vol. III. † Ibid.

‡ *Trifolium repens.* § Goring in Communications, &c. Vol. III. ‖ Young in Communications, &c.

¶ *Trifolium medium.* ** Young in Communications, &c.

†† Corrected Report of Lincolnſhire. ‡‡ Sir John Sinclair in Communications, &c. §§ Ibid.

‖‖ *Medicago lupulina.*

kinds. It may be objected to as being only a biennial; but as it annually ſheds much ſeed, it is ſaid to ſeldom wear out of the lands on which it is eſtabliſhed. This plant is often diſtinguiſhed by the titles of *Nonſuch*, *Yellow Clover*, &c.

As it is always of much importance to the farmer to have the land he lays down for paſture to produce an ample crop the firſt year; and as there are ſome graſſes or plants which require two or three years to eſtabliſh themſelves, and acquire their perfect growth, while others arrive at their extreme growth and expanſion the firſt year after they are ſown; ſome of the latter ſort ſhould be choſen, among which trefoil will be found highly valuable. This proves the advantage of mixing it with other ſown graſſes. Some think the quantity of four pounds of trefoil ſeed to the acre is too ſmall; and intend in future either to double it, or add as much red clover ſeed, which may be more proper. In this quantity, it is ſuppoſed, they will not injure the other graſs ſeeds ſown at the ſame time, but furniſh a copious vegetation until the others come to perfection, at which period both the trefoil and red clover have a natural tendency to diſappear or wear out*. The ſeed may be readily procured, and without much expenſe. It has likewiſe been found to anſwer on the ſtone-braſh ſoils by Mr. Davies†. On chalky, and all the drier ſorts of ſoil it is recommended as proper and beneficial‡.

Rib Graſs or Rib-wort Plantain§. —This is a plant much reliſhed by neat cattle and horſes; and on grounds that are rather ſoft and porous, as ſands and loams, in good heart, and which have a tendency to moiſture, it affords a large produce of herbage; but on thoſe that are very dry and binding, its produce is but ſcanty‖. But on theſe it is aſſerted to anſwer for ſheep-paſture, though inferior to others¶. It has been long eſtabliſhed in ſome diſtricts, where it is in much eſteem for ſheep-feed, but from its ſucculent nature improper for hay**.

According to a late writer, it ſeems a good plant for thickening the bottom of the graſs. Cattle are ſaid to have a diſlike to it, by ſome; but certainly the flowering-ſtems are here eagerly eaten by all ſorts of ſtock. It is early in flower, and flouriſhes particularly in moſs lands that have been drained in a perfect manner††. It affords ſeed in great plenty. *The Graſs-leaved Plantain*‡‡ is alſo a plant capable of being employed with advantage in the laying down lands to paſture. It is ſaid to ſucceed on barren ſoils and clays. It has the property of reſiſting the

* Campbell in Communications to the Board, &c. † Ibid. ‡ Boys in Ibid.
§ *Plantago lanceolata.* ‖ Anderſon's Eſſays, Vol. II. ¶ Ibid.
** Marſhall's Rural Economy of Yorkſhire. †† Ibid. ‡‡ *Plantago tenuifolia.*

TREFOIL OR BLACK NONSUCH.

(Medicago lupulina.)

BIRDSFOOT TREFOIL
(Lotus corniculatus.)

effects of the ſea air; and, as growing well on land liable to be covered with ſalt water, may be a valuable plant in ſuch ſorts of ground. Its leaves, from their ſmallneſs, have the appearance of the thicker and better ſorts of graſs. Both cattle, ſheep, and horſes, feed upon its leaves with much greedineſs, but particularly ſheep, which pare it as cloſe as poſſible *. It affords much ſeed, which is capable of being eaſily collected.

Burnet †.—It is a plant that may be cultivated for cattle; but its principal uſe is for ſheep paſturage. It ſucceeds on moſt ſorts of ſoils, as thoſe of the ſandy, clayey, and peaty kinds. It is aſſerted to form a large proportion of the natural paſturage of extenſive tracks on the moſt fertile parts of the South Downs; and it abounds much on moſt other downs of the chalky kind ‡. Its moſt beneficial application is in the way of an early green feed for ſheep, or other ſorts of ſtock. It ſhould be always made uſe of while in its more young and tender ſtate of growth, as being better reliſhed by the animals. In ſoils that are fertile and ſuited to its cultivation, it is ſaid, under proper management, to ſometimes afford good paſturage in the latter end of January, and through the whole of the two following months. The ſevere weather in winter affects it leſs than moſt other herbaceous plants, being ſo hardy as in ſome caſes to vegetate in that ſeaſon, when the weather is a little open. If not fed down, it may be cut at the above period as a green food for animals. Its property of reſiſting the effects of drought in the ſummer ſeaſon, is likewiſe a circumſtance of much importance in its favour. It has alſo the quality of getting thicker and more cloſe on the land by time §.

For the purpoſe of hay it is a plant that is ſaid to afford a large produce, but which requires to be cut rather early, to prevent its coarſeneſs. The ſeed is ſaid to be of much advantage in the feeding of horſes, and alſo the chaffy material ‖.

In the culture of the plant it is of vaſt importance to have good ſeed, and that which is of the proper ſort. It may be the beſt procured by ſelecting a part where the plants are good, as they afford it in a large proportion. Where the land is intended as a ſheep-paſture it ſhould be ſown broadcaſt over the ground; but in other caſes it admits of being cultivated in drills, in the ſame manner as lucern.

There are many other plants, both of the tare or vetch and ſweet pea, as well as other ſorts, that are ſaid to have been found highly valuable, eſpecially when kept cloſely fed down by cattle; but the trials that have yet been made with them are much too few to allow us to ſpeak of them in this place.

* Anderſon's Eſſays, Vol II. † *Poterium Sanguiſorba.* ‡ Young in Communications to the Board of Agriculture, Vol. III. § Annals of Agriculture, Vol. XXI. ‖ Ibid.

The different field-graſſes and herbaceous plants which have been deſcribed above, may be arranged and found uſeful in reſpect to ſoil, allowing for particular circumſtances, ſomewhat in the following order: for

Clayey Soils.—Marl or Cow Graſs; Rough Cock's-Foot Graſs; Creſted Dog's-Tail; Meadow Feſcue Graſs; Meadow Fox-Tail Graſs; Rough-ſtalked Meadow Graſs; Tall Oat Graſs; Trefoil; Meadow Soft Graſs, or Yorkſhire White; Meadow Cat's-Tail or Timothy Graſs.

Loamy Soils.—White Clover; Ray or Rye Graſs; Meadow Feſcue Graſs; Meadow Fox-Tail Graſs; Creſted Dog's-Tail Graſs; Poa, or Common Meadow Graſs; Meadow Soft Graſs, or Yorkſhire White; Meadow Cat's-Tail or Timothy Graſs; Smooth-ſtalked Meadow Graſs; Sheep's Feſcue Graſs; Hard Feſcue Graſs; Yarrow; and Lucern;

Sandy Soils.—White Clover; Ray or Rye Graſs; Meadow Soft Graſs, or Yorkſhire White; Sweet-ſcented Vernal Graſs; Sheep Feſcue Graſs; Yarrow; Burnet; Trefoil; Rib Graſs.

Chalky Soils.—Yarrow; Burnet; Trefoil; White Clover; Saintfoin.

Peaty Soils.—White Clover; Creſted Dog's-Tail Graſs; Rough Cock's-Foot Graſs; Rib Graſs; Meadow Soft Graſs, or Yorkſhire White; Ray or Rye Graſs; Meadow Fox-Tail Graſs; Meadow Feſcue Graſs; Meadow Cat's-Tail or Timothy Graſs.

Conſiderable latitude muſt, however, be allowed in the uſe of theſe, both on account of the variations of ſoil, and the differences in the ſtates of preparation in the lands, as well as the convenience or difficulty of procuring the ſeeds of them.

Early Herbage.—In this point of view they may alſo ſtand ſomewhat in the following manner*: Sweet-ſcented Vernal Graſs; Meadow Fox-Tail Graſs; Smooth-ſtalked Meadow Graſs; Rough-ſtalked Meadow Graſs; Tall Oat Graſs; Rough Cock's-Foot Graſs; Hard Feſcue Graſs; Burnet; Rib Graſs; Ray Graſs; Trefoil; Broad-leaved Clover.

Abundant Produce.—In this reſpect the following order may perhaps be proper: Ray Graſs; Tall Oat Graſs; Broad Clover; Burnet; Meadow Cat's-Tail Graſs; Meadow Fox-Tail Graſs.

Too few experiments have yet been made with regard to the differences in the feeding properties of different graſſes, to afford any correct arrangement of them in that view; yet, as diſtenſion, as well as the nutrient principle, is requiſite in the ſupport and fattening of all animals, it may not be improbable but that thoſe graſſes or other plants that abound in ſweet-jointed ſtems, and at the ſame time

* Curtis's Practical Obſervations.

afford much foliage, may be the moſt nutritious. The ſuperior utility of thoſe graſſes that run much to ſtem, as well as of broad clover, tares, and other ſimilar plants, in the ſupport of different ſorts of ſtock, ſeem to countenance the ſuppoſition. And it is probably on the ſame principle that the firſt crops of hay are better capable of ſupporting work-horſes, than thoſe which ariſe from the ſoft laxative herbage of the aftermath.

Graſs-Seed.—As moſt of the beſt graſs-ſeeds may now either be purchaſed in the ſeed-ſhops, or be eaſily obtained in the manner that has been mentioned above, there will of courſe be much leſs difficulty in laying down land with proper graſſes than was formerly the caſe.

In reſpect to the proportion of ſeed that may be the moſt proper and advantageous under different circumſtances, it muſt depend in a great meaſure upon the nature of the ſoil, the ſituation of the land, the ſtate of preparation to which it has been brought, and the intentions of the cultivator in its application. But old tillage lands will in general require a much larger proportion of ſeed than thoſe which have been more recently broken up*. Cold expoſed ſituations alſo ſtand in need of a greater quantity of ſeed than thoſe that are low and warm: and where the lands are deſigned for paſture a larger proportion than where hay is the principal object.

Clayey Soils.—On theſe ſome adviſe the following proportions as the moſt proper: Marl or Cow Graſs, 5lbs.; Trefoil, 5lbs.; Creſted Dog's-Tail Graſs, 10lbs.; Meadow Feſcue Graſs, one buſhel; Meadow Fox-Tail Graſs, one buſhel. And where the three laſt cannot be procured, Meadow Soft Graſs, or Yorkſhire White, two buſhels; Meadow Cat's-Tail or Timothy Graſs, 4 lbs.; or Meadow Cat's-Tail or Timothy Graſs, 4lbs.; and Yorkſhire White, one buſhel†.

Others recommend, on the heavy ſorts of lands that are to be broken up in a year or two, from ten to fourteen pounds of red clover; but where they are to remain in permanent graſs, Marl or Cow Graſs from 4lbs. to 6lbs., and White Clover 4lbs. ‡.

Loamy Soils.—Theſe are ſuppoſed to require the following proportions, by ſome experienced cultivators: White Clover, 5lbs.; Creſted Dog's-Tail, 10lbs.; Ray Graſs, one peck; Meadow Feſcue Graſs, three pecks; Meadow Fox-Tail, three pecks; Yarrow, two pecks. Or where the ſecond cannot be had, Ray Graſs, one peck; Rib Graſs, 4lbs.; and in the room of the laſt three, Meadow Soft Graſs,

* Sir John Sinclair in Communications to the Board, &c. Vol. III.

† Young in Communications to the Board, &c. Vol. III. ‡ Ibid.

or Yorkſhire White, half a buſhel; Meadow Cat's-Tail or Timothy Graſs, 4lbs.; Marl or Cow Graſs, 5lbs.*;

There are others, however, that adviſe, on all dry ſoils, White Clover, 4lbs.; Marl or Cow Graſs, from 4 to 6lbs.; and of Hop or Yellow Clover, from 2 to 4lbs. And for permanent paſture it is the practice of an intelligent farmer in Devonſhire to ſow White Clover, Marl or Cow Graſs, and Hop or Yellow Clover, in the quantity of each from 6lbs. to 7lbs. with the beſt Ray Graſs, in the proportion of one buſhel. In this method a conſtant ſucceſſion of food is ſuppoſed to be preſerved for five or ſix months in the year; as the Hop Clover and Rye Graſs flouriſh in the early part of the ſpring, the Marl or Cow Graſs being in perfection in about the middle of ſummer, when the former begins to diſappear, and the White Clover becomes in its perfect ſtate a month or ſix weeks later, continuing through the reſt of the ſeaſon †.

On ſuch loams as have a ſubſtratum of the ſtone-braſh kind, it is recommended by an experienced agricultor to ſow per acre: of Ray Graſs, one buſhel; Marl or Cow Graſs, 10lbs.; White or Dutch Clover, 3lbs.; Hop Clover, or Trefoil, 1lb. ‖

Without diſcriminating the particular kind of ſoil, Dr. Wilkinſon, who has had much experience, recommends the uſe of White Clover in the proportion of 12lbs.; Broad Clover, Trefoil, and Rib Graſs, of each 4lbs.

Sandy Soils.—On this deſcription of land the following proportions have been found by ſome the moſt uſeful: White Clover, 7lbs.; Trefoil, 5lbs.; Burnet, 6lbs.; Ray Graſs, one peck; Yarrow, one buſhel: or inſtead of the laſt, Rib Graſs, 4lbs.; Ray Graſs, one peck ‡.

But on the ſame ſorts of ſoil other experienced agricultors only make uſe of White Clover and Trefoil in the proportion of 5lbs. each, with a buſhel of Ray Graſs, and about an equal quantity of collected graſs-ſeeds to the ſtatute acre §.

As graſſes even in the richer ſorts of lands of this nature are liable to be much injured by the moiſture being too quickly conveyed away in the ſummer ſeaſon, it would ſeem proper to put in a full proportion of ſeeds in all caſes. On the poorer and thinner ſorts, the quantities recommended in the above caſes may often be augmented, eſpecially in the Burnet and Ray Graſs, with advantage.

Chalky Soils.—Theſe are found to ſucceed with the following quantities: Burnet, 10lbs.; Trefoil, 5lbs.; White Clover, 5lbs.; Yarrow, one buſhel; or in its place, Ray Graſs, one buſhel ††.

* Young in Communications to the Board, &c. † Sir John Sinclair in Ibid. ‖ Davis in Ibid.
‡ Young in Communications, &c. § Greenall in Communications to the Board, &c. Vol. III.
†† Young in Communications to the Board, &c.

On this deſcription of ſoil, Mr. Boys, an intelligent cultivator of much experience, adviſes Rib Graſs, 8lbs.; White Dutch Clover, and Marl or Cow Graſs, each 4lbs.; and Yellow Trefoil, 4lbs. He alſo ſpeaks highly of the uſe of Saintfoin in ſuch caſes. And as in this, as well as the preceding ſoil, the graſſes are apt to be injured by the heat of the ſummer ſeaſon, the land ſhould conſtantly be well ſtocked with graſs plants.

Peaty Soils.—In this ſort of land the proportions of ſeed adviſed below are found to ſucceed well by ſome: White Clover, 10lbs.; Creſted Dog's-Tail Graſs, 10lbs.; Ray Graſs, one peck; Meadow Fox-Tail Graſs, two ditto; Meadow Feſcue Graſs, two ditto; Cat's-Tail or Timothy Graſs, one ditto: or in the places of the ſecond, fourth, and fifth, Meadow Soft Graſs, or Yorkſhire White, ſix pecks; Rib Graſs, 5lbs.; Marl or Cow Graſs, 4lbs.*

An able and experienced agricultor thinks it a matter of the greateſt importance, that a full quantity of ſeeds ſhould be ſown in all caſes where the land is intended for paſturage†.

In the laying down land for the purpoſe of good meadows, the following proportions of theſe different graſs ſeeds have been recommended per acre, for lands that are of the moiſter kind: Meadow Fox-Tail Graſs and Meadow Feſcue Graſs, each two pecks and a half; Rough-ſtalked Meadow Graſs and Smooth-ſtalked Meadow Graſs, each a peck and a half; Creſted Dog's-Tail Graſs and Sweet-ſcented Vernal Graſs, each three quarters of a peck; White or Dutch Clover, and Wild Red Clover or Broad Clover, each one peck and a quarter. Where the grounds are much inclined to moiſture, the Creſted Dogs'-Tail Graſs and Smooth-ſtalked Meadow Graſs may be left out. Theſe are ſaid to ſoon form a good turf; and, from their being hardy perennials of vigorous growth, are not liable to be overpowered by the coarſe indigenous plants of ſuch lands‡.

In lands which are to be conducted under a convertible ſyſtem of corn and graſs, it will in moſt caſes be the moſt adviſable practice to ſow ſeeds of the artificial graſs kind, as Broad Clover, Saintfoin, &c., according to the nature of the ſoil, with thoſe of White Clover, Ray Graſs, and ſome others.

In caſes where the lands are to be kept in a permanent ſtate of ſheep paſture, though it has been adviſed by ſome to have recourſe to the finer ſorts of graſſes, it is probably a matter of leſs importance than has been commonly ſuppoſed, as the coarſer ſorts, when in a ſtate of ſufficiently cloſe feeding, become gradually finer

* Young in Communications to the Board, &c. Vol. III.

† Wilkinſon in Communications to the Board, &c. Vol. III. ‡ Curtis's Practical Obſervations.

and better; but in order to produce this effect in the fulleſt manner, they ſhould conſtantly be ſo eaten down, as to prevent any of the ſeed-ſtems from advancing. The Tall Oat Graſs, the Cock's-Foot Graſs, and the Meadow Soft Graſs, have, under this ſort of management, become ſufficiently fine, and the ſame effect has long been known to be produced on Rye Graſs, by the cloſe eating of it down by animals.

Time and Method of Sowing.—In accompliſhing theſe different operations, different modes are practiſed according to the manner of preparation and the particular circumſtances of the land. In reſpect to the firſt, or the periods of putting in the graſs ſeeds; the moſt uſual has been in the ſpring, at the time that the grain crops are ſown: but where the ground has been brought to a ſuitable ſtate of preparation by means of green or other fallows, the latter end of the ſummer, as about Auguſt, has been the more general ſeaſon. In the former caſe they are commonly put in with the grain crops; but in the latter, without any other ſort of crop. There has been much diverſity of opinion among agricultural writers with regard to the ſuperior utility of theſe different ſeaſons of introducing the ſeeds, as well as with regard to their being ſown with or without other ſorts of crops. The advantages of the autumnal over thoſe of the vernal ſowings are contended to be: thoſe of the graſs plants being leſs expoſed to danger from the ſhade, cloſeneſs, and choking that muſt neceſſarily occur at the latter ſeaſon; there being leſs riſk of ſtocking the ground with noxious weeds in caſe of the ſeeds of hay chambers being indiſcriminately ſown*; their being put in upon a better preparation and more mellow and fertile ſtate of the land; their growth being more ſtrong and vigorous from their not being robbed of their proper nouriſhment by other exhauſting crops, and the great ſuperiority of the hay produce: while on the contrary it is maintained in ſupport of the vernal ſowings, that beſides their being leſs precarious, ſhade is neceſſary in the early growth of the graſs plants to protect them from the effects of heat; the moiſture is better preſerved in the ſoil for their ſupport; ſmall annual weeds more effectually prevented from riſing to injure them; and the loſs the farmer muſt ſuſtain from the want of the grain crop guarded againſt†.

* Cloſe, in Communications to the Board, &c. Vol. III. It is remarked by this author, that "ſowing rubbiſh in Auguſt is not of ſo great importance as in the ſpring. In the former ſeaſon all the annual ſeeds vegetate, and if the beginning of the winter be mild, they will bloſſom; but they cannot perfect their ſeed, and the firſt froſt deſtroys them. If ſown in the ſpring they vegetate, bloſſom, perfect and ſhed their ſeeds, and thus ſtock the land with noxious weeds. The facts he has ſtated muſt, he ſays, do away the objections to ſowing rubbiſh. It is immaterial, he thinks, what you ſow, if you do but obtain an abundant crop, and leave your land clean and in good order."

† Anderſon's Eſſays, Vol. I.

But though ſome of the arguments urged on both ſides of this contraverted point may be objected to, the autumnal ſowings not preventing the perennial weeds from riſing and ſhedding their ſeeds in the following ſummer, nor the great cloſeneſs of grain crops being without injury to the growth of the young graſs plants; there are facts that render it not improbable but that each method may have advantages under particular circumſtances. In the more ſouthern diſtricts, where the ſeverity of the winter ſeaſon is later in its approach, the autumnal ſeaſon may frequently be made uſe of with advantage, after fallow crops, for ſowing graſs ſeeds, eſpecially in caſes where the lands are in too rich a condition for the ſucceſsful growth of corn. But in the more northern parts of the kingdom, and expoſed ſituations, where the froſts ſet in at an early period, it may be in general the moſt adviſable practice to put the ſeeds in, in the vernal months, with ſuitable crops of the grain kind. An intelligent writer of much experience has indeed obſerved, that graſs ſeeds anſwer almoſt equally well in either method: he prefers the Auguſt ſowing without corn, though the ſucceſs of his trials in the different ſeaſons has not juſtified any deciſive concluſion*. It is even admitted that in moory and mountainous ſituations, where the ſnows come early, autumnal ſowings are not adviſable, or to be performed later than the very early part of Auguſt; the vernal ſeaſon with oats for being cut young for ſoiling, or hay, is conſtantly to be preferred. Mr. Dalton, in Yorkſhire, after trying other methods, recommends the autumn without corn as the moſt adviſable. And the Reverend Mr. Cloſe ſtates that "a friend of his, wiſhing to procure a good meadow or paſture around his houſe, fallowed the land for barley; but the ſpring proving wet, and the ſoil being a ſtrong loam, he could only put half of it in order for that crop, which was ſown, and laid with clover and rye graſs. The other part was fallowed, and ſown in Auguſt with the ſweepings of hay chambers. The barley was a good crop, and the clover and rye graſs were probably equal to the firſt year's cut of hay. The ſecond year the artificial graſſes began to fail; worſe the third, fourth, and fifth: the ſixth year, after having received two dreſſings, the ſpontaneous product of the ſoil began to give a fleece over the ſurface of the land. About ten years after theſe lands were ſown Mr. Cloſe ſaw this field, when the part ſown in Auguſt was worth at leaſt fifteen ſhillings per acre more than the part which had been ſown with artificial graſſes in the barley. Thus from actual experiments, numbers of which he could adduce, he concludes that ſowing the ſweepings of hay chambers in Auguſt is preferable

* Rev. Mr. Young in Communications to the Board, &c. Vol. III.

to ſowing artificial graſſes in the ſpring with any crop of corn. Suppoſe, ſays he, the corn worth five pounds per acre, the difference in the produce of hay or ſeed in the ſecond, third, fourth, and fifth years, would more than counterbalance this; and the proprietor would find a permanent improvement in his land of from fifteen ſhillings to twenty ſhillings per acre."

On comparative experiments being made with corn in the ſpring months, and without it in Auguſt, the latter was found by much the beſt mode by different cultivators*.

But in the experiment of an accurate agricultor, mentioned by the Rev. Mr. Young †, in comparing different methods of vernal ſowings, in which four acres were ſown with ſeeds alone, on peaſe and buck-wheat ploughed in the preceding autumn; five acres with barley; and five more with the ſeeds put in alone without corn or manure: the portions ſown alone were overrun with weeds, and only preſerved from being ſmothered and deſtroyed by being eaten down by a dairy of cows.

Others, after repeatedly trying the experiment of ſowing in the ſpring with corn, and the autumn without, and from long and extenſive practice, conclude, "that, even if we were to have no regard to any other circumſtance except the graſs crop alone, it would always be beſt to ſow it with ſome kind of grain; but when we conſider likewiſe the loſs that the farmer thus ſuſtains for want of a crop of grain, the practice of ſowing alone muſt be looked upon as highly pernicious to the farmer‡."

It is probably in this laſt reſpect that the greateſt diſadvantage of the practice conſiſts, as without it the farmer can derive no immediate recompenſe for his great expenſe of tillage and preparation of the land.

Where the vernal ſowing with other ſorts of crops is had recourſe to, barley is that which is the moſt uſually recommended, and "there ſeems to be no queſtion that barley is in general the fitteſt grain to be ſown with graſs-ſeeds. The ſame tilth which anſwers for the one is requiſite for the other. Barley has a diſpoſition to looſen the texture of the ground in which it grows; a circumſtance highly favourable to the vegetation of graſs-ſeeds, which require a free and open ſoil to extend their roots in; the tender and delicate fibres of which have much difficulty in contending with the reſiſtance of a ſtubborn ſoil. And this points out the reaſon why graſs-ſeeds ſo frequently fail on ſtrong land not in a proper ſtate of cultivation.

* Mr. Lyeſter in Lincolnſhire, and M. Burgoyne, Eſq. in Annals of Agriculture, Vol. XIX.
† Mr. Dixon of Belford. ‡ Anderſon's Eſſays, Vol. I.

In the choice of barley, that ſort ſhould be preferred which runs leaſt to ſtraw and which is the ſooneſt ripe *." But as from the graſſy nature of the ſtem, and the large ſize of the ear in this ſort of grain, a conſiderable degree of cloſeneſs and ſhade muſt conſtantly be kept up, it ſhould never be ſown ſo thickly as in other caſes where there are no graſs-ſeeds. Some object to ſowing graſs-ſeeds with barley on other principles—as thoſe of its drawing its nouriſhment from the ſurface, which is alſo the caſe with the graſs-plants, and that in conſequence they muſt be greatly retarded in their growth from the want of due ſupport†. Where the land is in a proper ſtate of preparation and tillage, if ſown with oats, they will be apt to become ſo luxuriant as to greatly injure, if not wholly deſtroy, the young graſs-plants by the cloſeneſs of their ſhade ‡. In ſome caſes they, however, ſucceed tolerably with this ſort of crop. On the ſtronger kinds of land the ſowing of graſs-ſeeds has been found to anſwer well with thin crops of beans. In an experiment of this kind, Mr. Dalton found that the beans did not "rob, but ſheltered and nouriſhed" the graſs-plants, the plan anſwering beyond his expectations.

The importance of having the ſurface mould in a fine ſtate in order to the more regular diſtribution and more perfect vegetation of the graſs-ſeeds, has been already noticed. But to effect theſe purpoſes in the moſt complete manner, the ſeedſman ſhould be accuſtomed to the buſineſs, and the ſeeds, as being of different weights, as little mixed with each other as poſſible. It is much better to have more caſts than to blend the ſeeds together for the ſake of diſpatch. For all the ſmaller ſorts of ſeeds, it has been ſuggeſted as preferable to deliver them by means of the Norfolk turnip trough, which has lately been adapted to clover and ray graſs §. This operation ſhould always be performed as ſoon after the land has been ploughed as poſſible, as under ſuch circumſtances the ſeeds vegetate in a much more quick and vigorous manner. But it ſhould never be attempted in ſuch a wet ſtate of the land as produces any great degree of tenacity or adheſiveneſs in the mould, as in ſuch circumſtances the ſeeds would be apt to come up in a tufty unequal manner. Nor for the ſame reaſon ſhould the lighter ſorts of graſs-ſeeds ever be ſown in windy weather; as the delivering them in an equal and regular manner is a point of conſequence to the forming of good graſs-land. In the covering in of the ſeeds, care ſhould be taken that none are left in an expoſed ſtate on the ſurface of the ground, as when that is the caſe many of them will be de-

* Cartwright in Communications to the Board, &c. Vol. III.
† Dalton in Ibid. ‡ Cloſe in Ibid. § Young in Ibid.

ſtroyed or picked up by birds, and the ſward appear patchy. This buſineſs is executed in the moſt complete manner by a pair of light ſhort-tined harrows at one tining. The practice of employing buſh harrows is improper, as in that way the ſeeds are liable to be drawn into lumps. In all the lighter and more ſpongy deſcriptions of land, it may be advantageous to paſs a light roller over the ſurface immediately after the ſeeds have been well harrowed in.

In caſes where the tenants and not the proprietors of the lands are to lay them down to graſs, it may be the moſt adviſable practice for the latter to procure the ſeeds; but at the expenſe of the former; eſpecially where they have a ſufficient intereſt in ſuch lands,—as, without this precaution, from their general propenſity to keep the grounds under the plough, and their indifference in reſpect to the obtaining of the moſt proper ſorts of ſeeds, there may be danger of the buſineſs being improperly performed*.

After-management of new Graſs Lands.—This is a matter of conſiderable importance, and upon which much of the ſucceſs of forming good graſs land depends.

As ſoon as the crop with which the ſeeds have been ſown has been removed, it is adviſed by ſome to have recourſe to rolling the land with a moderately heavy roller, when it is in ſuch a ſtate of dryneſs as juſt to admit the impreſſion of the implement†; as by this means, from the mould being preſſed cloſely about the roots of the plants, their early growth may be much benefited, and the danger of drought prevented. The practice is, however, the moſt neceſſary in the more light and porous deſcriptions of land. Others likewiſe recommend the application of manure at this period, in order to promote the growth and ſupport of the young graſs-plants ‡; but this would ſeem quite unneceſſary when the mode of preparation that has been juſt deſcribed has been attended to.

As the ſurface of ſuch grounds as have been newly laid down to the ſtate of ſward is, from the previous tillage which they require, extremely tender, and readily broken into holes for ſome time even in the drier deſcriptions of land, the turning in of cattle with the view of feeding them down muſt in moſt caſes be highly prejudicial by the treading which they cauſe. The beſt practice is therefore probably to ſuffer no ſort of ſtock to be put upon ſuch lands till the ſpring after their being laid down §; or where the farmer finds it abſolutely neceſſary to turn upon the lands, the lighteſt ſort of ſtock ſhould conſtantly be ſelected for the pur-

* Communications to the Board of Agriculture, var. loc. Vol. III.

† Cartwright and Maxwell in Ibid. ‡ Wilkinſon in Ibid. § Maxwell in Ibid.

poſe. It has been obſerved that the advantage of feeding ſuch lands during the autumn and winter ſeaſons is ſcarcely a matter of any conſequence, as the ſpring feed for ſheep, where it is omitted, is of ſo much greater utility, a very early paſturage being in this way afforded for ewes and lambs *.

As to the advantages in the ſucceeding management that may be had recourſe to, in different caſes and circumſtances, there is much contradiction in the opinions of different experienced cultivators, ſome maintaining the ſuperiority of keeping the ground cloſely fed down by ſheep or neat cattle, while others conceive mowing or feeding as preferable. There ſeems little reaſon to doubt but that feeding by ſome ſort of ſtock is a much better practice than thoſe of either mowing or feeding; the chief difficulty is in reſpect to the ſort of ſtock that is the moſt proper. On the more dry and firm ſorts of ground a mixed ſtock may be the moſt advantageous, as neat cattle and ſheep, as in that way the new paſture may be fed down in the moſt regular manner; but on thoſe that are of a more open, porous, and leſs firm quality, ſheep, by their eating ſo cloſely, may do much harm, eſpecially in the firſt years of the new lay, by pulling up the young and imperfectly eſtabliſhed graſs-plants. Several inſtances of this kind we have noticed in ſuch ſoils. In lands that are more inclined to moiſture, the conſuming of the produce by neat cattle muſt conſtantly be liable to do miſchief, except in very dry ſeaſons; they muſt of courſe be principally fed down by ſheep. And in all caſes where the new lay is chiefly conſtituted of the more coarſe ſort of graſſes, ſheep would ſeem to be the moſt proper kind of ſtock, as the graſſes are thereby conſtantly becoming more fine and ſweet. Many facts of this nature have been noticed by cultivators. The ſweetneſs of the paſturage on many ſheep downs has been remarked to depend more on their being kept cloſe fed down than any other circumſtance, as on being neglected in this reſpect it becomes coarſe, and is rejected †. It has been well obſerved, indeed, that "ſheep-feeding not only ameliorates by enriching the ſoil, and fining the herbage, but alſo by deſtroying weeds ‡." We have been aſſured by a very extenſive and experienced cultivator in Somerſetſhire, that under this ſort of management, not only many coarſe graſſes but other ſorts of plants become fine, and eagerly fed upon by animals.

Doctor Wilkinſon, who has been much in the habit of comparing different practices, adviſes the grazing conſtantly with ſheep, and for the firſt ſix years never to

* Young in Communications to the Board, &c. † Agricultural Reports of Wiltſhire and Stirlingſhire.
‡ Young in Communications to the Board, &c. Vol. III.

permit the ſcythe to touch the lays. And the Reverend Mr. Young has well obſerved, that it is not merely the firſt year that feeding with ſheep is the beſt practice on new lays, but it may be ſo managed the ſecond, and if it extend to the third it is the better: and though there is not any neceſſity for adhering to it any longer, it has been found to anſwer well in his practice, four, five, or even ſix years; and in general he thinks it may be concluded, that the more the land is fed with ſheep, the greater the improvement will be. But in this management the impoveriſhing abſurd ſyſtem of removing the animals to be folded in other places, is not to be had recourſe to.

It has been long the practice in many diſtricts with the moſt improved cultivators, to have recourſe to the method of ſheep-feeding for ſome time after laying the lands down to graſs, as two years or more*. And where ray graſs and white clover are intended to remain ſome years, it is found, by ſome, advantageous to eat them the firſt year by ſheep, in cloſing, thickening, and rendering them more permanent†. Theſe facts are all in evidence of the great propriety and utility of the practice of feeding new graſs lands. It muſt however be obſerved, that in order to render the practice as ſafe and beneficial as poſſible, the new lays ſhould not be fed during the autumn, or the ſtock turned into them at too early a period in the ſpring. Nor ſhould they be too heavily ſtocked, or the ſtock kept in the paſtures too long, eſpecially when it conſiſts principally of ſheep, as they may do much harm by paring and eating the plants ſo cloſely down, as immediately to kill them, or expoſe their roots too much to the deſtructive effects of drought. And in caſes where the graſſes have run up much to ſtem, if the lands be ſufficiently ſtocked with plants, it may be an uſeful method to cut them over by means of a ſtrong ſcythe before their ſeeds are formed, as by this means they will become more ſtrong and vigorous: but, in the contrary circumſtances, they are better left for the purpoſe of providing a more abundant ſupply of young graſſes, as the benefit obtained in this way will more than counterbalance the injury ſuſtained by the running up of the old plants.

But though the practice of feeding new laid graſſes in the firſt years appears to be the moſt advantageous and proper mode of management, eſpecially for lands intended for paſture, there are many caſes in which they may be mown with great ſucceſs. This practice is perhaps always the moſt beneficial and proper, and indeed the only one that can be ſafely adopted in ſuch ſoils as poſſeſs any great de-

* Corrected Agricultural Report of the North Riding of Yorkſhire.
† Corrected Report of Perthſhire.

gree of moiſture, as under ſuch circumſtances the feeding them down with any ſort of live ſtock muſt in moſt ſeaſons be injurious to the ſward. And, beſides, where the object and intention of the farmer is chiefly hay, the graſs-plants, by being kept cloſely eaten down by live ſtock for a conſiderable length of time before the ſcythe is applied, may, from their becoming thereby diſpoſed to a low and lateral ſpreading growth, be afterwards more unfit for the production of hay crops. Several facts of this nature are related by writers on huſbandry. In one caſe, where different diviſions of land of the ſame kind were laid down in the ſame manner, on one of them being kept in the ſtate of paſture and the other alternately mown and paſtured, after ſome years both being ſhut up for hay, that which had been paſtured afforded a much inferior produce to the other *. The ſame thing has happened in other caſes of old paſtures being converted to hay lands, even when the moſt favourable ſeaſon prevailed †.

On theſe principles it may be a more judicious practice to manage lands deſigned for hay without having them for any great length of time, previouſly to their being mown, fed down cloſely with ſtock, as in this way a larger produce of hay may be afforded.

Where the new lays are mown the firſt year after being laid down, which is not a method to be generally recommended, it is an excellent practice to apply a moderate coat of manure over them in the autumn, eſpecially when the ſtate of the land and the ſeaſon is ſuch, in reſpect to dryneſs, as to admit of its being done without injuring the ſurface ſward; as by this means the graſs-plants not only become more ſtrong and vigorous, but better eſtabliſhed in the ſoil, and of courſe bear cutting with much leſs injury.

As it may ſometimes happen, though it can be but ſeldom, where the methods that have been detailed above are fully attended to, that the cultivator may fail either in part or wholly of producing a good lay: in the firſt caſe it is the beſt practice to have recourſe to ſowing freſh ſeeds, which ſhould be performed in the early part of the ſpring, when the weather is in a moiſt ſtate, the ſeeds being adviſed by ſome to be trodden in by putting ſheep upon the land either indiſcriminately, or by very open folding, as the uſe of the roller will not be effectual, and that of harrowing cannot be practiſed without injury ‡. Doctor Wilkinſon has found advantage from putting the ſeeds in before the manure was applied in the new

* Wight's Syſtem of Huſbandry, Vol. IV.

† Young in Communications to the Board of Agriculture, Vol. III. ‡ Ibid.

lays, which are ſometimes too haſtily ploughed up. By either method the ſward of ſuch lays may often be much thickened and improved.

And in caſes where the graſſes have run up much to ſtem, if the lands be ſufficiently ſtocked with plants, it may be an uſeful practice to cut them over by means of a ſharp ſcythe before their ſeeds are formed, as by this means they will be more ſtrong and vigorous and the lands be leſs injured; but in the contrary circumſtances they are better left for the purpoſe of providing a more abundant ſupply of young graſſes, as the benefit obtained in this way will more than counterbalance the injury ſuſtained by the old plants.

Where there is a complete failure from particular cauſes, the moſt adviſeable practice is, in caſes where the ſeeds have been put in in the ſpring with grain crops, to take off theſe crops as ſoon as they will admit of it; and after giving the land one ploughing, directly to harrow in freſh ſeeds. The buſineſs ſhould be accompliſhed as early in the beginning of Auguſt as poſſible. A roller may be applied over the land when in a ſuitably dry condition about October. But where the latter end of ſummer has been the period of ſowing, it is recommended that the land ſhould have three ploughings performed upon it in the early ſpring months, when the weather is ſufficiently dry, and the graſs-ſeeds be again put in with a crop of buck wheat in May, which, though it is not a ſuitable crop for the heavy wet ſorts of land, ſometimes anſwers well in dry ſeaſons; and in wet ones, as affording but little ſeed, may be mown when in bloſſom as a green food for cows. From its not robbing the land much of its fertility, it is well adapted for the above purpoſe*.

In regard to the application of manure to new laid down graſs lands, though it will ſeldom be abſolutely requiſite, where they have been returned to the ſtate of ſward under the degree of fertility and preparation that has been already adviſed, it may in moſt caſes be had recourſe to with great advantage and improvement, as it is probably one of the beſt means of preſerving a good cloſe ſtate of ſward when judiciouſly employed. It has been remarked by an experienced cultivator, that though in general no manure will be wanted till the land has been mown for hay, there can be little doubt but that great additional improvement will be produced where manure of any ſort can be applied, and that "the oftener the land is manured, the greater will be the improvement†."

If the lands have been laid to graſs with corn crops, the application of a ſlight dreſſing of manure in the autumn following may, as has been already ſeen, be of great utility in fixing and encouraging the growth of the young graſs-plants; but

* Young in Communications to the Board of Agriculture, Vol. III. † Maxwell in Ibid.

in other caſes the latter end of the ſummer following, or very early in the autumn, are ſuppoſed by ſome to be the moſt beneficial periods for the purpoſe; but as at theſe times, in many inſtances, much loſs of manure may be ſuſtained both by evaporation, and the waſhing of heavy rains and ſnows, it may be a better and more adviſable practice to perform the buſineſs in the early ſpring months, eſpecially where the lands are to be conducted under the ſcythe, as in this way the enriching material will be ready to exert its influence at the moment the young plants begin to ſend forth their new ſhoots; and thus not only afford more aſſiſtance in thickening and invigorating the new ſward, but be leſs in danger of being uſeleſsly diſſipated and waſted *.

But where manure cannot be ſpared for repeatedly dreſſing new graſs lands, as the graſſes are often, eſpecially on lands not well ſuited to their growth, liable to decline and become thin, in ſome inſtances it is ſuppoſed from the ſown graſſes diſappearing before the ſpontaneous ones have attained ſufficient vigour and ſtrength †, but more generally, probably, from the grounds not having been in a proper ſtate of fertility or fineneſs of ſurface mould at the time the ſeeds were put in, or the particular unfavourableneſs of the ſeaſon, about the cloſe of the third ſummer after their being ſown, it is believed to be a better practice to defer the uſe of manure till that time on ſuch lays as are paſtured; and when they are under the ſcythe, till the hay crop has been taken from the ground ‡. We have no doubt of the ſucceſs of the application of dung top-dreſſings at theſe periods, though they muſt evidently be made uſe of in a leſs economical manner than at a later ſeaſon in the autumn, or an earlier one in the ſpring. And it is the moſt common opinion that all the finer and more ſoluble kinds of top-dreſſings are applied with the greateſt benefits in the very early ſpring months, as about the latter end of February, or the beginning of the following month. The differences in the effects of theſe ſorts of manure have, perhaps, not yet been fully aſcertained.

In encouraging and ſupporting the growth of the natural graſſes when the ſown ones decline about the third year an experienced cultivator §, who ſeems to favour the opinion of manure being the moſt uſefully laid on land early in the autumn, or on hay lands immediately after the crops have been taken off, ſtates that he has "uſed coal aſhes with great ſucceſs, to the amount of three chaldrons per acre. He has laid of this manure on graſs land above 50 chaldrons in a year. About eight years ago he laid down a field of 12 acres with broad clover principally,

* Section on Manures. † Wilkinſon in Communications to the Board, &c. Vol. III.
‡ Young in Ibid. § Dr. Wilkinſon of Enfield.

intending it to ſtand only for two years. In the ſummer it was mown twice, next year it was grazed: the clover was but weak. As he had particular reaſons for altering his mind, and for wiſhing to continue it in graſs, he reſolved to try the effects of grazing it with ſheep. On the fourth year it looked ſo very bad, the clover almoſt entirely diſappearing, that he was tempted to plough it up. He, however, reſolved to continue the grazing, and to give it a dreſſing of three chaldrons per acre of coal-aſhes. The next year he obſerved the white clover and natural graſſes beginning to form a cloſe turf, and the field is now an excellent piece of ſward, without the aid of any hay-feeds."

It would appear from the further trials of the ſame intelligent agricultor, that the following ſubſtances have much effect, not only in promoting the growth and rendering the herbage more fine and ſweet, but in renovating the ſward.—"The ſcrapings of the road, or ſand-drift, are, he ſays, of great ſervice in producing a ſweet herbage. Wherever the ſweepings of his own walks have been laid on an adjoining common, he has obſerved the coarſe graſs diſappearing, and the fine bents ſhowing themſelves. He has a field now in his own occupation which, from a piece of coarſe herbage, has been brought into ſuch a luxuriant ſtate of ſward that it is eſteemed the beſt piece of graſs land in the pariſh. The improvement was in part owing to its ſituation near a brook, which brought down from a contiguous common a quantity of leaves and ſand-drift: theſe were carefully collected and laid on the meadow every year."

And he has uſed fold-yard liquor with advantange.—"Having laid down a field to graſs immediately adjoining his fold-yard, which was ſituated above it, by means of pipes and trenches he had the liquor from the fold-yard conducted over the field, after having collected it in a reſervoir: the effect of it in deſtroying coarſe graſs, and producing a ſweeter ſward, was very remarkable."

The effects of watering have likewiſe been found powerful in the reproduction of ſward; "and where it can be had at command, land may with great facility be broken up for corn, and afterwards returned to a ſtate of meadow. In two different meadows, which during the winter were frequently flooded, he has pared off part of the turf, and has obſerved that the ground became green the firſt year, and on the ſecond it was ſo covered with graſs that he could with difficulty diſtinguiſh where the ſward had been taken off. He has known the ſame land pared a ſecond time in three years, and ſpeedily covered again with a coat of ſward after having been frequently flooded."

The effects of the following manures, according to the experience of the ſame cul-

tivator, would ſeem to be chiefly in promoting the luxuriance of the graſſes, and of courſe to be principally advantageous in reſpect to the quantity of produce. "Tallow-chandler's graves on being uſed to the amount of a ton an acre, at half-a-crown a hundred weight, the graſs was rendered ſo rank that for ſome time cattle would not touch it, and the hay was too coarſe for ſale. On account of its rankneſs he generally uſes it mixed with mould or ditch earth. Its effects are viſible for ſome years after it has been laid on in the ſuperior verdure of the graſs."

It is obſerved, that the effects of "night ſoil have been abundantly proved both in Flanders and the neighbourhood of London. The quantity uſed on graſs land is about three loads an acre. It is a ſtronger and more permanent manure than common dung."

In the fixing, producing, and rendering the white clover more permanent, the following ſubſtances have been found by the ſame gentleman to have conſiderable powers. On "the application of marl he mentions one fact, which is, that he has known it ſucceſsful in fixing the white clover on ſtrong cold land, from which it is very apt to diſappear. He has likewiſe found folding of great advantage in fixing and forwarding the white clover. Coal-aſhes, will, he ſays, produce this clover on wet land; but unleſs the land is drained it will ſoon grow weak or diſappear." It has alſo been obſerved, that on the drier clayey lands in Cornwall, "ſea ſand is found to mellow the clay and make them hold the graſſes." And on what are often termed ſtone braſh lands the uſe of marl is found of great utility, when applied in the latter part of the ſummer of the firſt year of the lay. But it is neceſſary, to the ſucceſs of this ſort of application, that the ground be well covered with graſs before it is applied, as where the ſurface is much expoſed, the marl is liable to plaſter and cake together, and the young graſs-plants to be in conſequence expoſed to much injury from the heat of the ſummer. This ſubſtance ſeems to bring up the beſt ſort of natural graſſes. In time this is, however, ſunk below the reach of vegetation. About thirty cart loads are ſufficient for the acre. And chalk on the deep loamy clays is found an uſeful application the firſt year on new lays, in the proportion of about twenty loads to the acre *. And on the more ſandy deſcriptions of land clayey marl may be of great advantage in eſtabliſhing the graſs. On peaty or moory lands marl and other ſimilar materials will be of advantage in rendering them more compact, and better ſuited for preſerving the graſſes; and ſand and road ſtuff for fining the herbage.

The advantages from the two following ſubſtances do not ſeem ſo important.

* Davis in Communications to the Board, &c. Vol. III.

Soot has been much uſed as a top-dreſſing, but Dr. Wilkinſon has not obſerved "the effects to laſt beyond the firſt year. He has tried it to the amount of ſixty buſhels per acre, at 8d. per buſhel; perhaps it ſhould be uſed in larger quantity. Lime is nearly as dear, and of that he has uſed 160 buſhels per acre on arable land. If he uſes ſoot again he intends to lay it on to that amount. But he has uſed ſugar-baker's ſcum with great ſucceſs to the amount of two loads an acre, at half a guinea per load, which has been found a ſtrong warm manure, highly ſerviceable on cold land, its effects being permanent." Lime is found uſeful on the more friable red loamy ſoils, by fixing and rendering them more cloſe, to keep the vegetation more to the ſurface, as well as to promote the growth of the natural graſſes, and prevent their roots from being injured by the heat of the ſun.

The following materials are probably chiefly uſeful in protecting and nouriſhing the young graſs plants in their more tender growth; but they are more ſlow in producing their beneficial effects.—"Woollen rags, though not generally uſed as manure on graſs land yet, when chopped ſmall, have been ſpread with advantage on young clovers before winter to the amount of about 10 cwt. per acre*."

On applying, in order to compenſate for an immediate crop of hay, and to thicken the ſward, on one part of a field rotten dung about eight tons to the ſtatute acre, on another part woollen rags chopped at the rate of 100 ſtones to an acre; and on a third a rich marl in the proportion of about 80 tons to the ſtatute acre: Dr. Campbel, on comparing their effects two years after their application, found that "the dung had produced the greater luxuriance. The woollen rags had a ſuperior verdure, a deeper green: but as they had not yet been properly incorporated with the land, by the graſs growing over them, their ultimate produce could not be aſcertained. An acre of land may, he ſays, be manured by this means for about 3l. effectually, ſhould they be found to anſwer the purpoſe." The ſame is the caſe with "the marl, which having covered the ground into which it is not yet carried down by the rains, and the graſs not having grown through, it has at preſent rather done harm than good." On this account it is ſuppoſed that marl is long in producing its beneficial effects, and the return of which cannot be looked for in leſs than two or three years.

Theſe facts ſufficiently ſhow that different effects may be produced on graſs lands by the application of different ſorts of ſubſtances to them in the manner of top-dreſſings after they have been laid down. That where fine herbage is the principal object in view, coal aſhes and compoſts of the earthy kind, formed from ſand, mud,

* Wilkinſon in Communications to the Board, &c. Vol. III.

ſcrapings of roads, and other ſimilar materials, intimately blended and incorporated with ſuitable proportions of well rotted dung, may be the moſt advantageous applications. The liquor of fold-yards and watering may alſo be uſeful in the ſame intention, as well as thoſe of reſtoring the ſwards, and promoting the luxuriance of the crops. But where the increaſe of produce is chiefly intended, good dung in a well reduced ſtate, tallow-chandler's graves, night ſoil, chopped rags, ſoot, ſcum of ſugar, and other manures of the more animal kind, are the moſt beneficial and proper. In other views, as thoſe of eſtabliſhing and preſerving the different graſſes—marll, ime, chalk, the folding of ſheep, and other ſubſtances and operations of the ſame nature will be the moſt ſuitable for producing ſuch effects. And in rendering the lands more firm and ſolid, the laſt three ſubſtances may probably be had recourſe to with the greateſt benefit and ſucceſs.

Artificial Graſſes.—The methods that ſeem the moſt advantageous in reſtoring different ſorts of tillage lands to the ſtate of graſs, as well as thoſe which appear the moſt proper for afterwards bringing them into the moſt perfect ſtate of ſward and productiveneſs, having been thus explained, it may be neceſſary to deſcribe the modes of culture that are beſt ſuited to the raiſing crops of the artificial graſs kind, and the means of conſuming them with the greateſt chance of profit and advantage.

The general introduction and interpoſition of crops of artificial or ſown graſſes between thoſe of the corn kind is a practice of the greateſt utility and importance, as the lands are thereby not only prevented from being ſo much exhauſted as would otherwiſe be the caſe, and at the ſame time rendered fit for the growth of particular kinds of grain without the neceſſity of fallowing, but a much larger proportion of green and other food than could otherwiſe be obtained is provided for the ſupport of live ſtock. It has of courſe chiefly laid the foundation of the late improvements in arable cultivation as well as live ſtock.

As moſt of the plants employed in this way are of conſiderable ſize and ſtrength, or luxuriance of growth, they muſt of courſe, as well as the natural graſſes, require the ground on which they are cultivated to poſſeſs a good ſtate of fertility, and a conſiderable fineneſs of mould, as where this is not the caſe they ſeldom ſucceed in a perfect manner, or afford that abundance of produce which would otherwiſe be the caſe. Like the natural graſſes they ſhould alſo be adapted to the peculiarity of the ſoil on which they are to be grown, as they are all found to anſwer better on ſome kinds of land than others. Some of them ſucceeding moſt perfectly on the heavier ſorts of ſoil, as thoſe of the more dry, loamy, clayey, and ſtronger gravelly deſcriptions; others on the more ſtrong, poor, and thin kinds of

calcareous lands, as thoſe of the chalky and limeſtone ſorts, and others on the deep fertile grounds which abound in vegetable matter.

*Red Clover**.—This is a plant which is well known, and that riſes to conſiderable height, with a rather ſtrong ſtem, affording a large produce of leaf and bloſſom, on which account the land is kept in a more perfect ſtate of cloſeneſs and ſhade, while the crop remains upon it, than is the caſe with moſt other plants of the artificial graſs kind. On this principle it has of courſe much more influence in ameliorating and improving the ſoils, and affords a better preparation for wheat crops †.

Red Clover is capable of being cultivated with ſucceſs and advantage on almoſt all the more heavy and dry deſcriptions of land which are in a tolerable ſtate of fertility, and it is ſaid to ſucceed on the deeper kinds of gravelly, chalky, and ſandy ſoils ‡.

In reſpect to preparation it is leſs nice than many other herbaceous plants, yet the finer the ſtate of mould the land has been brought into, the more certainly and the better it ſucceeds. And as wheat is the grain crop that moſtly follows clover, it may in general be the moſt advantageous practice to apply manure for the crop with which it is grown, as by that means the ground will be in the moſt ſuitable condition for that crop. It may be ſown with any clean grain crop, but is found to ſucceed the beſt with barley after turnips §, where the nature of the ſoil will admit, as the land in that way is brought into the beſt ſtate of preparation for its reception.

Seed.—It is of much conſequence in the raiſing of crops of this ſort to ſow ſuch ſeed as is perfectly good, freſh, and well ripened; as from its being kept in the ſhops for a conſiderable length of time much of it is frequently in a ſtate unfit for vegetating. That which is good has a bright appearance, ſlides eaſily in the hand, ſmells ſwee and has the purple coloured ſeeds greatly prevailing over thoſe of a yellow caſt.

The proportion of ſeed that is neceſſary muſt vary according to the quality of the land, the ſtate of preparation to which it has been reduced, and that of its fertility; as in rich lands almoſt every ſeed grows, while in thoſe of the contrary deſcription many of them fail in producing plants, eſpecially in dry ſeaſons, and a great number of the plants are apt to die away after they have come up. It ſeems not improbable but that both theſe inconveniences might in a great meaſure be removed by having recourſe to ſteeping the ſeed in ſome liquid for a ſhort time in ſuch ſeaſons, before it is ſown on ſuch ſorts of land, as by this means it will be made to vegetate in a more quick, regular, and vigorous manner, without remaining in the ſoil in an inactive ſtate till it becomes unfit for producing healthy plants.

On the richer ſorts of ſoil that are clean from weeds, ten or twelve pounds may be

* *Trifolium pratenſe.* † Marſhall's Rural Economy of the Southern Counties, Vol. I.
‡ Synopſis of Huſbandry. § Kent's Hints.

a ſufficient quantity for the acre, while ſixteen or eighteen pounds will not be too much for thoſe that are of a more ſtiff quality, and poſſeſs a leſs degree of fertility. Where the land is to be converted to the purpoſe of paſturage for two or more years, it may alſo be advantageous to ſow a larger proportion of ſeed than where it is to be broken up in the following ſeaſon. And where it is to be cut for hay it is better to be ſown rather thin, as the plants will be in leſs danger of being drawn up weak *.

Time and Method of Sowing.—It may be put into the ground in any of the more early ſpring months with crops of ſpring corn, or ſown over the young wheat crops at the ſame ſeaſon. When it is ſown with oats the moſt common time of putting it in is about the beginning of March; but with barley it is performed at a later period, as in April. It may therefore, perhaps, be more properly ſown with this crop than oats in the later diſtricts, where it might be apt to ſuffer from the froſts in the preceding months. On the richer ſoils, as from the luxuriance of its growth too much of it is frequently cut with the barley, ſo as to keep it in the field ſo long as to expoſe it to danger, eſpecially in bad ſeaſons, or from the barley becoming rank and lodging, great injury may be done to the clover, it may be more adviſable to ſow it with the oat, or over the wheat crops. But on the thinner ſoils there is ſeldom any danger to be apprehended in this way. In order to prevent its proving hurtful to the barley in its early growth, by the rapid progreſs which it makes in ſome caſes, it has been recommended not to ſow it till the barley has ſprouted to the height of two or three inches, as it may then be performed to equal advantage as at an earlier period, the barley being rather benefited than injured by the ſlight harrowing which is neceſſary †. In ſowing it among wheat it is the beſt method, eſpecially in the ſouthern diſtricts, to have the buſineſs performed at as early a period in March as the land becomes ſufficiently dry to admit of harrowing ‡.

Clover crops may likewiſe be raiſed without being mixed with thoſe of the grain kind. In very rich ſoils this may indeed often be the moſt advantageous practice, as the danger of either crop being injured by the other will be fully obviated. The ſowing in this caſe ſhould be executed as early in the ſpring as the ſtate of the land and that of the ſeaſon will with ſafety permit.

When clover is ſown with grain crops on the more fertile and better prepared

* Corrected Report of the Weſt Riding of Yorkſhire. † Modern Agriculture, Vol. II.
‡ Report of Middleſex.

lands, with the intention of being kept in the ſtate of paſture for ſome time, the grain ſhould always be ſown much thinner, or in leſs proportion than is uſual under other circumſtances, as in this way the danger of its lodging and injuring the clover plant may be avoided *. In ſowing it with barley it may according to ſome be put in by the drill-machine, after that crop has been ſown, broadcaſt being immediately covered by light harrowing. The practice of drilling it in the ſame drills with the barley, as employed by Ducket, is leſs common, and by no means ſo good.

In putting clover in with grain crops the moſt common practice is to perform the buſineſs either immediately, or as ſoon as poſſible, after the grain has been covered in, as all ſmall ſeeds vegetate in much the moſt perfect manner when put in ſoon after the ſoil has been turned up, as has been already explained.

With whatever ſort of crop the clover ſeed is ſown, it ſhould be diſperſed in as regular and even a manner as poſſible over the ſurface of the ground when in the broadcaſt method, after it has been rendered perfectly fine by the harrowing in of the grain crops. And in order that this may be effected in the moſt complete manner, it ſhould be performed, if poſſible, when the mould is in ſuch a ſtate of dryneſs as to work well under the harrow. But it ſhould on no account be executed when the ſoil is in ſuch a ſtate of moiſture as to clog or ſtick much together †, as under ſuch circumſtances the ſeed will neither vegetate well or be covered in in a regular manner, being liable to be drawn into heaps by harrowing. In covering it in, a light ſhort-tined harrow is the moſt adapted to the purpoſe, which in the freer and more mellow ſorts of land ſhould only be paſſed over once in a place, but in thoſe of the ſtiffer and more heavy kinds twice may be neceſſary. The ſeed ſhould never be buried to much depth, as its vegetation would by that means be much retarded. The uſe of the tined harrow is much preferable for this purpoſe to that of the buſh kind, as by the latter the ſeed is not only leſs perfectly covered in, but liable to be drawn ſo together as to riſe in tufts. And merely rolling over the land, though ſometimes employed, is a practice never to be depended upon.

Where the clover is ſown among the green wheat, harrowing it in with ſuch light harrows once in a place is the beſt practice in all caſes, except where the wheat is very thin, and the ſoil too looſe about its roots to permit it with ſafety. In all the more light deſcriptions of land, the uſe of the rolier after the ſeed has been covered by the harrow muſt be of great utility, as well in cloſing the particles of the ſoil

* Synopſis of Huſbandry. † Ibid.

round the ſeeds as in levelling the ſurface, and rendering it leſs penetrable by drought. And even on ſtrong ſoils, where the clover is ſown among the wheat, it is recommended by ſome as of great uſe after harrowing *.

There is a practice which prevails in ſome diſtricts of ſowing a larger ſpace of land than can be covered in at the ſame time, but it is an injudicious method and ſhould never be attempted, as clover ſeed always vegetates the moſt perfectly when it is covered in immediately after it has been ſown, and it is apt to be much injured by lying expoſed for ſome time upon the ſurface of the land before being harrowed in, eſpecially if much wet ſhould fall.

With ſome it is a practice when the land is intended for the purpoſe of early paſturage, and in ſome caſes where the object is hay, to ſow rye, rib, and other ſimilar graſſes with the clover. In the firſt intention the practice may be beneficial, as the rye graſs riſes early, and may contribute to afford a more full and better herbage for the ſtock at ſuch periods, eſpecially on the later ſorts of ſoil †; but with the latter view it ſhould perhaps ſeldom be made uſe of, as the clover will in general produce a ſufficiently abundant crop of itſelf; and from other ſorts of plants being mixed with it, on account of their drying in an unequal manner, it may ſuſtain injury as hay. It is probably for ſome reaſon of this ſort that ſuch clover hay as is mixed with other graſſes is leſs ſaleable, and of conſiderably leſs value in the London markets, than that which conſiſts ſolely of clover ‡. Some cultivators, however, ſuppoſe, that by blending rye graſs with clover, in a ſmall proportion, a ſtrength and body is given to the crop §. It has been ſuggeſted as an improvement where rye graſs is mixed with clover, to ſow the latter a week or two before the other, as from the clover plants having a tender, weak ſtem in their early growth, they may in that way be prevented from being injured by thoſe of the rye graſs claſping round and ſhading them ||.

If the crop be deſigned for cutting green for the purpoſe of ſoiling animals, it would ſeem to be the beſt method not to ſow any other ſort of graſs with the clover, as no advantage can be gained in that way **.

After-management.—Where the ſeed has been put in on a proper ſoil in a ſuitable ſtate of preparation, little attention will be neceſſary to the crop afterwards. But as the young plants while in the ſtate of ſeedling-leaf are liable to be attacked by ſlugs or other inſects, in the manner of turnips, by which the plants are often greatly

* Corrected Reports of Middleſex and Northumberland.

† Marſhall's Rural Economy of the Midland Counties. ‡ Corrected Report of Middleſex.

§ Corrected Report of the Weſt Riding of Yorkſhire. || Corrected Report of Perthſhire. ** Ibid.

thinned and deſtroyed, the crops ought to be carefully attended to in their early growth. Many acres have ſometimes been completely ruined in the courſe of a few nights*. Such effects are to be prevented by putting in the crops as ſoon as poſſible, that they may become ſufficiently ſtrong and vigorous before the dry weather ſets in, and by the uſe of ſuch means as have been adviſed for turnips.

With ſome it is the cuſtom to apply manure over the clover crop immediately after the grain has been taken from the land, which in ſoils that are not in a good ſtate of fertility may be advantageous in preſerving and invigorating the plants; but under other circumſtances it is not neceſſary. There is, however, another caſe in which the uſe of what is termed long ſtable dung, when not in the ſtate of fermentation, may be found uſeful, by preventing the young plants from being too cloſely nibbled and eaten up by ſheep, which is that where the land is in the ſtate of commonage †.

But when the clovers are to be continued for two or more years, the application of a thin coat of manure, in the autumn or ſpring ſeaſon, is a practice from which great benefit may be derived, eſpecially on lands that are in the leſs perfect ſtate of heart. In the drier ſorts of ſoil this buſineſs may probably be done with the greateſt advantage about the latter end of February; but where the lands are ſoft, retentive of moiſture, and poachy, the early part of the autumn, while the ground is ſufficiently hard, may be the moſt ſuitable ſeaſon for the purpoſe. Well-rotted dung is perhaps the moſt proper in theſe caſes. By performing the work at this period there is leſs danger of the clover plants dying away in the winter than is the caſe under other circumſtances ‡. At whatever ſeaſon the manure may be applied, it ſhould be ſpread out over the ſurface in as even a manner as poſſible and beaten perfectly fine. It is the practice in ſome places to ſow coal-aſhes over the young clovers, in the latter end of January or the beginning of the following month, when they are intended to be mown in the following ſummer, in the proportion of about thirty buſhels to the acre, by which means the crops are rendered more abundant and the plants better preſerved §.

The methods of diſpoſing of crops of this ſort are either by mowing them for hay, cutting them occaſionally as green food for different ſorts of live ſtock, or feeding them down with cattle, sheep, and other animals.

In the firſt mode a large quantity of hay for the purpoſe of feeding working horſes may be procured with but little expenſe or trouble. In theſe caſes the crops

* Corrected Report of Middleſex. † Ibid. ‡ Ibid.
§ Hertfordſhire Report, and Annals of Agriculture.

ſhould be mown as ſoon as moſt of the heads are in full blow, before they begin to turn of a brown colour and die away. The moſt proper time may be known by attending to the foliage on the bottom parts of the plants, as when the leaves on theſe begin to drop off and decay the crop ſhould be cut as ſoon as poſſible, as by ſtanding afterwards it will loſe more in the bottom than it can gain in the top*. The crops uſually attain this ſtate ſome time about the middle of June, according to the nature of the ſoil. Though it is ſuppoſed by ſome that clover takes leſs harm by ſtanding, after it is in a condition for being mown, than many other ſorts of plants it is always the beſt practice to cut it rather early, as by remaining on the ground it not only loſes its heads and lower leaves and becomes reduced in quantity, but the plants are rendered hard and ſticky, and ſo exhauſted as to remain a great length of time after mowing before they ſend up new ſhoots and afford good herbage†. After it has been cut, Mr. Middleton adviſes that the ſwaths ſhould not be ſpread out, as is the common practice with meadow graſs, but ſuffered to lie in the ſtate the ſcythe leaves them until they are dried about two-thirds through, which, if the ſeaſon proves favourable, will be in about three days, and if the weather ſhould then appear promiſing, they may be turned with rakes immediately after the dew is off. If there be no rain, the clover thus ſpread out will be ready to cock up the next morning, or on the fourth day, as ſoon as the dew is fully gone, and may be carried in as ſoon afterwards as is convenient. And if this be done as ſoon as the dew is well off, the leaves will be juſt ſufficiently tough to preſerve them whereas when this operation is omitted in the morning; and performed in the heat of the day they will be too dry, being reduced to powder, and loſt in the buſineſs of heaping and loading. When, however, it is heaped ſufficiently early in the morning, the loading and ſtacking may continue through the day. Where a part of the produce is become rather over dry, there is a method adopted by expert haymakers of putting the rows into heaps without rubbing the leaves off. It is only familiar to a few, and is performed by rolling the ſwaths over with rather larger forks than uſual in a very gentle manner, keeping them from being ſeparated or broken, and then laying them lightly into the cock, being careful to avoid breaking and toſſing the hay about, putting it along the ground, or beating it down flat. In this mode of converting clover into hay there will not only be much leſs loſs, but the hay be of a much better colour and

* Corrected Report of Middleſex. † Corrected Report of Perthſhire.

finer flavour; which are circumſtances of great importance both in its ſale and uſe as fodder.

Where a ſecond crop is to be taken for the ſame purpoſe, all cattle ſhould be kept out of the field, in order that it may be in full bloſſom and ready for the ſcythe about the laſt week in Auguſt. It muſt be made into hay in the ſame manner as the firſt, and ſhould not be delayed later, on account of its loſing in weight, and the danger of not getting it into the ſtack before the heavy dews and rains ſet in. Beſides, by getting the hay off as early as poſſible, there will be more ſheep-feed previous to ploughing the land up in the autumn for wheat. The quantity of produce in the ſecond crop is in general conſiderably leſs than in the firſt, and not by any means ſo good in quality: conſequently, if hay be not much wanted, it is a better practice to feed it, eſpecially where the ſoil is ſufficiently dry, than make it into hay.

The quantity of produce in the firſt crop varies conſiderably; ſhowery ſummers producing great crops, while in dry ones they are often ſtunted to one half. Beſides, the natural quality of the ſoil has a conſiderable effect, as well as its being in a high or poor ſtate of cultivation. On the general average of years and ſoils in Middleſex, the two cuttings are ſaid to produce about three loads of marketable hay; which, for the laſt fifteen or twenty years, are ſuppoſed to have yielded twelve guineas per acre. In many caſes a much larger profit is afforded. By ſome, two tons are ſuppoſed to be a medium crop for the firſt cut*.

It is moſtly employed for the ſupport of draught-horſes, as it is the general opinion that it is more nouriſhing than any other hay, except that of ſainfoin. It, of courſe, ſells at about fifteen ſhillings a ton higher than hay of the meadow kind. It is alſo found highly uſeful in fattening oxen and in feeding milch cows; but is leſs eſteemed for ſaddle horſes, probably from its not having been ſo much in uſe, as it would ſeem well calculated for the purpoſe.

It is ſometimes a profitable practice to let the crop ſtand for ſeed. In this caſe, the method is either to eat it well down in the early part of the ſpring, till about the latter end of May, by ewes and lambs, or other ſorts of ſtock, or to let it ſtand for a firſt crop of hay, and depend upon the ſecond crop for ſeed. The firſt appears, however, by much the beſt practice, as the land is leſs exhauſted, conſequently in a better ſtate for the ſucceeding crop; and, at the ſame time, the

* Kent's Hints.

farmer has the great advantage of an early green-feed for his ſtock in the ſpring months. And it ſeems not improbable but that ſeed of a better quality may thus be obtained in a greater abundance, as the plants by being mown muſt be rendered more weak and leſs proper for affording good ſeed; while, by feeding down, they will not only ſuffer leſs in this reſpect, but throw out more flowering-ſtems, and, of courſe, afford a larger proportion of ſeed. Where the latter method is followed, the firſt cut ſhould be made as early as poſſible. It is always neceſſary to take off the firſt growth in one of theſe ways, as the clover plant does not perfect its ſeed early in the ſummer.

The crop thus reſerved for ſeed muſt be ſuffered to remain till the huſks, or bloſſoms, become perfectly brown, and the ſeeds have acquired a conſiderable degree of firmneſs. It ſhould then be cut, and harveſted in the ſame method as the common crop, but let remain in the field till it is more perfectly dry and criſp, in order that the ſeeds may become more fully hardened. It may then be laid up dry, in order to the ſeed being threſhed out in the winter ſeaſon at the farmer's convenience.

As the great difficulty in the ſecuring of the clover for this purpoſe is that of getting the herbage ſufficiently dry in the dewy and damp ſeaſon at which the ſeed becomes ripe: it has been ſuggeſted that light bags, formed of thin cloth or fine wire, might be uſeful for collecting, catching, and retaining the heads which moſtly riſe above the herbage, by being fixed upon the handles of the ſcythes, as they are ſwept off by them, being emptied as there may be neceſſity; as in this way the herbage, by being left upon the ground, would be of three times the value of the muſty ſtraw afforded by ſeed clover, either for the purpoſe of being eaten off or turned down as manure. Beſides, the heads by being well dried in wet weather in the houſe, and in dry ſeaſons in the open air, the ſeed would not only be preſerved with more certainty, but in a much better ſtate in reſpect to the ſample, and, of courſe, in moſt ſeaſons be of much greater value *. It appears ſcarcely poſſible, however deſirable it might be, to collect the heads in this way without ſuffering conſiderable loſs from their dropping down and being loſt in the herbage.

Much labour and expenſe is neceſſary in ſeparating the ſeed from the capſule, ſlough, or ſeed-coat, eſpecially when it is effected by threſhing, as the work is ſeldom, from its difficult execution, performed at leſs than from five to ſix or

* Marſhall's Rural Economy of the Southern Counties.

ſeven ſhillings the buſhel*. By the uſe of mills or other contrivances it may, however, be rubbed out with more facility, and at a much cheaper rate.

The produce in ſeed, like that of hay, is liable to vary much, under different circumſtances: in general it may be from about three to four or five buſhels when perfectly cleaned, weighing from two to three hundred weight. The principal objections to the ſeeding of clover crops are thoſe of their uncertainty, on account of the ſtate of the ſeaſon at which they become ripe, the trouble and expenſe of threſhing out the ſeed, and the injury which they produce in leſſening the fertility of the ſoil. The high value of the ſeed in moſt ſeaſons is, however, a great inducement to the letting of clover crops ſtand for the purpoſe.

But though much advantage may be derived from the converting of clover crops into hay, and letting them remain for ſeed, it is probable that a ſtill greater benefit may be produced by the practice of cutting the crops green occaſionally, as they attain a ſufficient growth, and conveying them when wanted to the horſes or other cattle in the ſtables and fold-yards, in order to their being conſumed in the ſtalls. It is contended, by an experienced agricultor, that, in this manner it will certainly ſupport more than twice the ſtock it would do if fed off upon the ground where it grew; and the additional quantity of manure that will by this method be made in the ſtables and yards, if they are kept well littered with any ſort of ſtraw, or even ruſhes or fern, will fully compenſate the farmer for his expenſe in cutting and bringing the clover into the yards †.

It is a method which experience in many parts of the kingdom has proved to be of the greateſt advantage, eſpecially where the buſineſs is not upon too extenſive a ſcale; but in large concerns it is, perhaps, impoſſible to attend to it ſo fully as may be neceſſary for deriving the greateſt benefit from it.

The reſult of an experiment ſtated by a writer of conſiderable accuracy, however, ſhows, that even on an extenſive ſcale it is a practice which is attended with vaſt advantage‡. In this trial ſeven acres of clover cut green were found to be ſufficient for twenty horſes, ſeven cows, five calves, and five pigs, for the period of ſeventeen weeks from the middle of May. They were fed in the ſtable and rick-yard, being taken twice in the day to water, and the horſes had neither hay or corn §. The great ſuperiority and utility of this practice is exhibited in a more ſtriking point of view, by contraſting this with the conſumption of the ſame ſort of

* Modern Agriculture, Vol. II. † Kent's Hints. ‡ Young's Eaſtern Tour, Vol. II. p. 147.
§ In calculating the value of the crop, it is remarked that the horſes could not have been kept

crop in the field, by an equal number of the ſame kinds of ſtock: as, in the time five acres had been uſed in the former method, thirty had been conſumed in the latter, and the horſe part of the ſtock left in much worſe condition.

But beſides the ſuperiority of the practice of ſoiling this ſort of crop in the economy of food, it has the important advantage, as has been ſeen, of affording much larger ſupplies of manure, eſpecially where the ſtalls and fold-yards are kept occaſionally well bedded and cleaned up, as the converſion of the materials proceeds, which muſt be greatly expedited from the vaſt increaſe in the urinary, as well as other diſcharges that muſt of neceſſity take place in this mode of feeding.

The great difference between feeding clovers off on the land and conſuming them in their green ſtate in the manner juſt mentioned, is ſuppoſed by an able writer* to be this: "the quick growth of this graſs, after mowing, ſhades the ground, and prevents the ſun from exhaling the moiſture of the land ſo much as it would if fed bare: conſequently it continues to ſpring with more vigour; and the moment one crop is off, another begins to ſhoot up. Whereas when cattle feed it, they frequently deſtroy almoſt as much as they eat; and, beſides, bruiſe the necks of the roots with their feet, which prevents the clover from ſpringing ſo freely as it does after a clean cut by the ſcythe. In hot weather, which is the common ſeaſon for feeding *clover*, the flies too are generally ſo troubleſome to the cattle, that they are continually running from hedge to hedge to bruſh them off;

equally well for leſs than eight-pence a day; but as the uſual price at which they are taken in at in that diſtrict is two ſhillings and ſixpence the week, it may be better to take that as the principle of calculation.

			£.	s.	d.
20 Horſes	17 weeks,	at 2s. 6d. per week	42	10	0
7 Cows	ditto,	at 2s. 6d. per week	14	17	6
5 Calves	ditto,	at 1s. 6d. per week	6	7	6
5 Pigs	ditto,	at ———	0	0	0
			63	15	0
		Or, per acre	9	2	1

The quantity of dung raiſed by the above ſtock is ſuppoſed to be from four to five hundred loads, which is eſtimated at 2s. 6d. per load.

The expenſe in labour for cutting and conveying the food to the ſtack is not charged; which renders the experiment in ſome meaſure incomplete. The benefit of the practice is, however, fully eſtabliſhed.

* Mr. Kent.

by which it is inconceivable what injury they do to the crop. But when they are fed in ſtables and yards they are more in the ſhade; they thrive better; and, at the ſame time, conſume the whole of what is given them without waſte."

Much of the ſucceſs attending this practice without doubt depends on theſe circumſtances; but beſides, the upper parts of the roots are leſs penetrated by moiſture, and fewer of the plants of courſe deſtroyed. By proper attention to this crop a very uſeful and abundant green food for different ſorts of live ſtock may be provided at an early period in the ſpring, eſpecially when the winters are not very ſevere. It is adviſed by ſome, on the poorer ſort of ſoils to have both the firſt and ſecond crops of this plant to be eaten green upon the land by ſheep and bullocks, being mown and given them to feed upon*."

In this way the cattle thrive better from their filling themſelves ſooner, and having more reſt; and there is no waſte. But in order to derive the greateſt poſſible advantage from the ſoiling with this or other crops, convenient covers, ſheds, or other ſuitable houſes are abſolutely neceſſary.

The practice of feeding down or paſturing clover crops with live ſtock, though it may be advantageous in many caſes, eſpecially where ſheep-huſbandry forms a principal object, always requires to be conducted with care and attention, both in reſpect to the plants and the animals that are to be fed upon them.

From the tender nature of the clover plant it ſhould ſeldom be eaten on the land by the heavier ſorts of cattle, as, from the greedy manner in which they feed, many of the plants are pulled up, and others, as has been ſeen, greatly injured or deſtroyed by being bruiſed in their treading, eſpecially as they protrude their young ſhoots. Horſes are particularly objected to on this account by many †. The moſt appropriate ſort of ſtock is obviouſly that of ſheep; but where the ſoils are of the drier kind, the lighter ſorts of ſtock of other deſcriptions may be occaſionally admitted, ſuch as calves, foals, and young beaſts. And as pigs are fond of the clover plant, and thrive well upon it, they may ſometimes be admitted with advantage. In the practice of lamb-ſuckling it is an uſeful application of the young clovers to turn the ewes upon them, as they afford a ſort of paſturage which has much effect in increaſing the flow of milk. They may likewiſe be applied to the fattening of ſheep in April and May; and be fed by the ſheep intended for turnips, in the autumn, till they are ready, with much profit‡. No ſort of ſtock ſhould however be kept upon crops of

* Middleſex Report. † Experienced Farmer, Vol. I. ‡ Middleſex Report.

clover when the land is ſoft, wet, or poachy. In ſome of the ſouthern diſtricts, where it is the cuſtom to eat down the young clovers by ſheep, it is indeed uſual to chooſe a dry ſeaſon for the purpoſe, the ſtock being removed in caſe the land becomes ſoft and wet*. Where this ſort of ſtock is employed, it may be the moſt ſafe practice not to permit the animals to continue too long upon the land; as by eating the plants too cloſely they may ſuſtain much miſchief.

It is conceived by ſome that treading the ſoil lightly while the lands are dry may be of great utility to the clover plants by forcing the earth to their roots, and in that way protecting and rendering them more capable of reſiſting the effects of froſt in the winter ſeaſon. It has likewiſe been ſuggeſted that the eating off the weak, lateral ſhoots, that were thrown out while under the ſhade of the grain crops, may be ſerviceable by increaſing the ſtrength of the plants, and enabling them to withſtand the froſts, as well as to ſhoot more ſtrongly in the ſpring †.

It would therefore, on the whole, appear the moſt beneficial method, where the paſturing of this crop either in the ſpring or autumn is had recourſe to, not to ſuffer the lands to be fed upon when in a moiſt ſtate, or to be too hard ſtocked, or with the heavier ſort of animals at any time.

But in the feeding down of clovers, there is not only danger of injuring the plants, but the animals that conſume them. Without proper management, cattle and other animals on being turned upon them often ſuffer great inconvenience, and are in danger of being deſtroyed by the vaſt diſtenſion of their ſtomachs which takes place. In this ſituation the animals are in the language of the farmer ſaid to be *blown* or *hoven*. The nature of the diſeaſe does not ſeem to be much inveſtigated: but it probably ariſes in conſequence of the large quantity of green ſucculent herbage being greedily devoured without due maſtication, by which it undergoes an uncommon degree of fermentation in the ſtomach; and from this ſudden decompoſition, an unuſual quantity of gaſeous fluid is at once ſet at liberty, which ultimately overcomes the contractile power of the digeſtive organ, and the animal is deſtroyed. The ſuppoſition is rendered more probable from the circumſtance of the affection being leſs apt to take place when the clovers or other ſimilar herbage are fed upon in a dry ſtate, as the ſtock in theſe caſes are not able to conſume them in ſo expeditious a manner or in ſo large a proportion.

On theſe principles, therefore, the practice of not ſuffering the cattle or other ſorts of ſtock to feed upon them when they are wet, and there is a full bite, would

* Marſhall's Rural Economy of Southern Counties. † Ibid.

ſeem to be perfectly correct. The advice of not turning the animals upon the crops before the ſun has diſſipated the dew and moiſture depoſited in the night is likewiſe judicious, and ought to be attended to, as well as that of keeping them in motion as much as poſſible when firſt turned in. With ſheep the ſame precautions may be neceſſary, if they be put upon them with the other ſtock in their full growth; but when they are turned in after they have in ſome degree been fed down, there will be little danger of their being injured. Where the clovers are eaten off as after-graſs in their ſoft, foggy, and young ſtate of growth, there is however great danger of the ſtock being hurt in this way, unleſs theſe circumſtances be attended to.

Various means of removing the diſeaſe, when the animals happen to be affected, have been propoſed, ſuch as common ſtrong ſalt and water; and new milk and tar in the proportion of about half an egg-ſhell full. This laſt is aſſerted to afford immediate relief on its reaching the ſtomach*. The ſtabbing the animal in the flank, cloſe to the hip-bone, with a ſharp penknife, ſo as to avoid wounding the inteſtines, placing a quill in the orifice to diſcharge the confined air, has likewiſe been practiſed with ſucceſs; but it never ſhould be attempted by unſkilful perſons. The uſe of long flexible tubes has alſo afforded great relief, by being introduced down the gullet into the ſtomach, and in that way drawing off the diſtending gas. This method is probably the moſt ſafe and effectual, though troubleſome in the application †. There is another remedy which we have found uſeful in removing this malady in its more early ſtage, which is that of a very ſtrong ſolution of prepared *ammonia* in water. By this means the confined air is in ſome meaſure diſcharged from the ſtomach, and almoſt immediate relief afforded.

Whatever remedy is employed, it ſhould be applied on the firſt attack of the diſorder, or as ſoon as the animal is perceived to be uneaſy, as there is never any time to be loſt, the diſtenſion proceeds with ſuch rapidity.

It is evident, from what has been ſaid on this plant, that it muſt be of vaſt advantage to have a ſufficient extent of it where much ſtock is to be kept, as it has been found, as paſture, to far exceed moſt ſorts of natural graſs in the ſupport of animals ‡.

The chief diſadvantage of this almoſt invaluable plant is that of the ſhortneſs of its continuing in the lands, eſpecially thoſe of the lighter and more free kinds. It is aſſerted by ſome not to laſt longer than two years, except on grounds that are perfectly *freſh*; and in ſome caſes where it has been often repeated not more than

* Modern Agriculture, Vol. II. † Tubes for this purpoſe are ſold in London.
‡ Modern Agriculture, Vol. II.

one*. In ſome of the ſouthern diſtricts, it is, however, found more durable on the calcareous ſoils, eſpecially where not frequently repeated on the ſame land, from its being better able to contend with weeds in its natural ſtate of growth †. Theſe facts ſhow the neceſſity of keeping it as far diſtant as poſſible in the courſes of cropping, eſpecially on all the more light friable ſorts of ſoil, and the ſuperior advantages of cultivating it on thoſe of the calcareous kind.

It is probable that its duration may be conſiderably prolonged by preventing the plants from ſhooting up to ſeed-ſtems as much as poſſible, either by keeping them cut by the ſcythe, or by feeding them down by ſtock in a moderate degree; as in theſe ways they will be prevented from being ſo ſoon exhauſted in their roots, as happens in many other ſorts of plants, as ſoon as they have perfected their ſeeds ‡. The froſty nights and hot dry days in the more early ſpring months, aswell as the cloſe ſunny weather in the ſummer ſeaſon, are highly prejudicial in deſtroying the clover plant §.

When the clovers are kept in the ſtate of herbage more than one year, they are not by any means ſo proper for ſowing wheat after as in other caſes: it is the full ſmothering crops that afford the moſt ſuitable preparation for this ſort of grain.

Beſides the common red or broad clover, there are other kinds uſed in cultivation; as the *White* or *Dutch* clover, and *Cow Graſs*. Theſe, from their being more frequently employed in the laying down of lands for the purpoſe of permanent graſs, have been deſcribed above. The firſt affords a fine delicate herbage, which is very agreeable to moſt ſorts of ſtock. In the ſecond it is more coarſe and abundant, but ſtill leſs ſo than the common clover; and the plant has the advantage of growing better, and of being more laſting in the poorer ſorts of clayey ſoils.

Trefoil ‖.—This, as being an uſeful plant in permanent graſs lands, has been already noticed; but its properties as an artificial graſs may be deſcribed in this place. It is of much leſs growth than common clover, and much ſlenderer in the ſtem; but notwithſtanding it is ſometimes ſown with grain crops in the manner of that crop, the proportion of ſeed made uſe of is about three pottles when cleaned from the huſks, but in the contrary ſtate two buſhels are moſtly employed. Theſe may however be varied according to the circumſtances of the land.

Some ſuppoſe it an advantageous practice, eſpecially where large ſtocks of cattle are kept, to ſow it with oats, or among the wheat crops in the ſpring when they are to be

* Kent's Hints. † Rural Economy of Southern Counties.

‡ Corrected Report of Perthſhire; and Rural Economy of Southern Counties, Vol. I.

§ Synopſis of Huſbandry. ‖ *Medicago lupulina.*

ſucceeded by grain in the following ſeaſon, as by this means good feed is produced in the ſtubbles for ſtock in the latter part of the ſummer and in autumn; and at the ſame time they are left free for tillage in the ſpring. The ſeed is capable of being procured at a cheap rate*.

It is ſaid alſo to afford excellent paſturage for cattle, but to be more particularly calculated for ſheep, either when in mixture with clover or alone, as it is not ſo liable to hurt them by *blowing* or *hoving* as that graſs. In the latter caſe it is of vaſt importance in the ſupport of ſheep, from its being more early than clover, and coming well in after the conſumption of the turnip and rye crops before the clovers are ready †.

When it is let remain for hay it does not afford a large produce, but a ſort which is highly uſeful as a ſheep-fodder in the winter ſeaſon, and leſs waſteful than moſt other kinds, and which, at the ſame time, is ſuppoſed by ſome leſs troubleſome in the proceſs of hay-making, though others aſſert that it readily mats together and becomes mouldy by wet ‡.

The ſeed is to be collected from the ſecond ſhoot in the manner directed for clover, and the produce is in general conſiderable, often affording ſeven or eight buſhels of clean ſeed from the acre. But on the whole it is much leſs valuable than common clover as an artificial graſs.

Saintfoin §.—This is a plant which, though leſs generally introduced into cultivation than clover, is not leſs important or uſeful to the farmer. It is on the lighter and thinner ſorts of calcareous ſoils, what that plant is on all thoſe of the ſtrong, heavy, and more deep kind; and it has the ſuperiority of being more durable. It is equally advantageous for the purpoſes of hay as thoſe of paſturage, and in the latter method has not, it is ſaid, the dangerous property of *hoving* or *ſwelling* the cattle that feed upon it, as is the caſe with clover. Its laſting properties on poor barren ſoils in hilly ſituations, where other ſorts of graſſy herbage are deficient or ſcarcely to be procured at all, likewiſe render it particularly beneficial in ſupplying a valuable green food for different ſorts of ſtock ‖.

The ſoils moſt proper for this ſort of graſs are thoſe of chalky loams, light ſandy or gravelly kind, or almoſt any of a mixed quality, provided they be not wet, and have a rocky or hard calcareous bottom, to check the roots at the depth of a foot or fifteen inches below the ſurface; otherwiſe they are apt to exhauſt themſelves in running down. On this account it is improper for being ſown where there is great depth of mould. It is aſſerted to afford a large produce even on thoſe of the

* Synopſis of Huſbandry. † Ibid. ‡ Kent's Hints. § *Hedyſarum onobrychis.* ‖ Kent's Hints.

St. FOIN.
(Hedysarum Onobrichis.)

pooreſt quality; and on ſuch as are of a more rich and friable nature it is often very abundant. It is only, however, in the calcareous ſoils, or ſuch as have been well impregnated with that ſort of matter, that this plant ſucceeds in a perfect manner, or becomes durable *.

In regard to the preparation of the ground, it cannot be made too clean or too fine before the ſeed is ſown; of courſe it generally ſucceeds beſt after turnips or other ſimilar crops which require a fine clean culture while they are growing. It often, however, anſwers well on lands that have not undergone ſo high a degree of preparation.

Seed.—This ſhould be ſelected from the beſt plants, and thoſe which are moſt ſuited to the ſoil of the cultivator by their durable properties †. It ſhould always be ſown freſh, as that which is old never vegetates well. The proportion of ſeed which is neceſſary muſt be different according to the circumſtances of the land; but in the broadcaſt method about four buſhels are probably in general the moſt proper quantity, as on theſe ſorts of ſoil it is better to have the plants thick: ſome, however, think leſs than half the above proportion ſufficient. In the drill mode three buſhels are moſtly employed. Seed of this ſort is uſually procured at from about three to five or ſix ſhillings a buſhel.

Time and Method of Sowing.—The earlier the ſeeds of this graſs can be put into the ground in the ſpring the better, as there will be the more chance of their vegetating in a perfect manner from the greater proportion of moiſture in the ſoil; as when the buſineſs is performed at a late period, if a dry ſeaſon follow, much of the ſeed would be prevented from growing, and the young plants that come up be more expoſed to the attacks of the fly ‡. The latter end of February or the beginning of the following month may anſwer very well in moſt caſes. It is, however, by ſome cultivators ſown in the autumn with the wheat crop; but the practice is not to be recommended, as there may be danger of its not growing well, or of being injured in the winter ſeaſon §.

It may be put in either alone or with any of the ſpring corn crops, but with barley after turnips is conſidered the beſt method. Some adviſe its being ſown with about half the quantity of barley which is uſually ſown for a full crop, as it may ſhade and keep it moiſt during the firſt ſummer; and at the ſame time not injure it from the crop being lighter, which is ſometimes the caſe. Where the barley is drilled, the ſaintfoin may afterwards be put in, in the ſame manner, but in a contrary direction. If ſown over the wheats, it ſhould be harrowed in, and

* Marſhall's Rural Economy of Southern Counties, Vol. II. † Ibid. ‡ Synopſis of Huſbandry. § Ibid.

afterwards rolled. In whatever method it is ſown, as the ſeeds are larger than thoſe of many other graſſes, they ſhould be covered in with more care and to a ſomewhat greater depth. Some adviſe the ploughing the ſeed in with a very thin or ſhallow furrow*. In moſt caſes, eſpecially in all the more light ſorts of land on which this crop is ſown, the uſe of the roller may likewiſe be neceſſary.

It is ſometimes a practice to ſow a ſmall portion of clover ſeed with this crop, with the idea of increaſing the firſt year's produce; but as plants of different kinds ſeldom ſucceed well together, from there being a continual conteſt in their growth for an aſcendency, it is probably a better practice to increaſe the proportion of the ſeed without mixing it with that of other ſorts. Mr. Marſhall, however, ſeems to think the method beneficial in ultimately procuring a fine clean crop of ſaintfoin.

After-management.—On this being properly attended to, a great deal of the ſucceſs in the culture of this plant depends. The moſt experienced cultivators of the graſs adviſe its being cut for hay inſtead of being paſtured. But others think it more advantageous neither to cut nor paſture it in the autumn of the firſt year. It is probable that both practices may be proper under different circumſtances, as in the richer ſorts of ſoil, where this plant moſtly affords a tolerable crop when ſown alone the firſt year, it may be mown with propriety and without much injury being done to the plants; but in thoſe of the thinner and more poor kinds, where the crops are in general the firſt ſeaſon but thin on the ground and light, it may be advantageous to let them remain without being cut or fed down by ſtock, as in this way they may ſpread more, and form a better and more cloſe ſward in the following year. By the plants in this caſe being ſuffered to ſeed, beſides the advantage juſt mentioned, they will have acquired a great vigour of growth, and the ſucceeding crops be greatly increaſed from the ſhedding of the ſeeds.

In all caſes, in the ſucceeding ſummers, a crop of hay may be taken, and the after-graſs be fed down with any ſorts of ſtock but ſheep till towards December, care being taken that they do not eat it in too cloſe a manner, as where that is the caſe, from the largeneſs of the roots, they may be in danger of injuring the crowns of the plants. In the following autumns there will, however, be leſs riſk in this reſpect, and ſheep, as well as cattle ſtock, may be turned in and kept upon the paſtures till they are all well eaten down, being always careful to ſhut them up as early as poſſible in the beginning of the year†.

The quantity of produce muſt of courſe be liable to vary much according to the

* Kent's Hints. † Ibid.

nature of the ſoil, and the care that has been beſtowed in the preparation: on a medium of ſoil and culture it may probably be eſtimated at about two tons. The poorer and thinner ſtapled ſorts of land, worth little more than five ſhillings an acre, will ſeldom afford leſs than from a ton to a ton and a half.

On the thinner ſorts of ſoil it can ſeldom be cut more than once, but on thoſe of the deeper kinds two crops are ſometimes taken in the ſame way as with clover.

In its green ſtate it is highly uſeful for all ſorts of ſtock; though ſome ſuppoſe, that when given to milch cows the milk is not ſo well flavoured.

When made into hay it is an extremely nutritious fodder for working-horſes, as well as other ſorts of cattle. And the after-graſs is highly valuable for weaning and ſupporting lambs.

As this ſort of herbage is ſuppoſed to be improved by being nipped by the froſt, it may be a proper practice not to turn upon theſe lays too early in the autumn.

The application of manure upon ſaintfoin lays is of great utility, when put on in the latter end of the ſecond autumn after they have been laid down. For this purpoſe peat aſhes are the beſt material where they can be procured. Other ſorts of aſhes are likewiſe found beneficial where theſe cannot be had. They ſhould be applied ſo as to form a thin even dreſſing; ſoot has alſo been found of great utility when ſpread evenly over theſe lays about the beginning of January, in the proportion of about twenty-five buſhels to the acre. And malt duſt has been employed in the ſame way with great ſucceſs*. Where top-dreſſings of this ſort can be applied every third or fourth year, the ſaintfoin crops, when well eſtabliſhed in the ſoils, may be preſerved in a ſtate of vigorous growth for ten or fifteen years, and the land be conſiderably improved by the roots†. It uſually attains its perfect growth about the third year; and begins to decline towards the eighth or tenth, if not well aſſiſted by manure in the manner mentioned above.

It is, in ſome caſes, a profitable application of this ſort of crop to cut it before it comes into flower, for the purpoſe of ſoiling horned and other ſorts of cattle, in the manner that has been deſcribed for clover.

The moſt uſual application of it is, however, in hay, which it affords of the beſt and moſt nutritious quality, both for horſes and other ſorts of cattle. The method of bringing it into this condition differs but little from that employed for clover. It is cut immediately on its coming into full bloſſom; and as it remains but a ſhort time in this ſtate, as much expedition as poſſible is employed both in mowing and making the produce into hay. This, of all other graſſes, requires the leaſt pains

* Synopſis of Huſbandry. † Kent's Hints.

in making. When the ſeaſon is fine the hay-makers may follow the ſcythe, and, having turned over the ſwaths, throw them into wind-rows the ſucceeding day after the graſs is mown, when it may be immediately formed into cocks, and the whole crop be fit for carting in a few days after it is mown: and though it may appear very green, and the ſtack when made take on a conſiderable degree of heat, there is no danger to be apprehended, provided the weather has been fair during the hay-making; as it is ſo far from taking harm by heating in the ſtack, that the contrary ſtate is moſt to be feared; and for this reaſon care is neceſſary not to ſuffer the fodder to continue long either in the ſwath or in graſs cocks, leſt the ſun and wind ſhould dry it up too faſt, and, by exhaling its juices, prevent its heating in the ſtack, and thereby render it of little value. In order to preſerve its ſucculence, in ſome places they put a number of the graſs cocks together, ſo as to form large cocks of a ſize to contain a load in each, and finiſh the ſtacks out of the cocks. It is likewiſe the practice with many farmers, when the crop is ſlight, to turn the ſwaths, and then run them into cocks with a three-pronged barley fork, following with a wooden dew rake, the head of which is of ſufficient width to cover the ground occupied by three or four ſwaths; in this manner proceeding with the utmoſt diſpatch, ſaving a deal of labour and expenſe*.

In letting this crop ſtand for ſeed, it ſhould remain on the land till the huſks become of a ſomewhat brown colour, and the ſeeds are perfectly plump and firm, as by theſe means they will not only be better, but in leſs danger of being injured in the field from the little time that it will be neceſſary for them to remain, and alſo leſs in danger of being hurt by heating when laid up. After this degree of maturity is attained, the crop ſhould be mown as ſoon as poſſible, and remain expoſed in the ſwath till the upper ſurface is fully dried: it muſt then be turned over in a very careful manner, ſo as to prevent the ſeed from ſhedding, as much as the nature of the buſineſs will admit. This ſide being rendered perfectly dry and criſp in the ſame way, the crop is either threſhed out upon cloths in the field, or laid up in ſtacks to be afterwards performed. The buſineſs of threſhing out the ſeed in this crop, however, is much leſs troubleſome than in that of clover. Where threſhing-machines are in uſe, it may be threſhed out with great facility in that method. When the ſeaſon is favourable the practice of threſhing it out in the firſt way is probably the moſt beneficial, as the ſtems, or haulm, may be laid up for the purpoſe of fodder in the ſtack.

The produce in ſeed is uſually from about four to five coombs in ſome diſtricts;

* Synopſis of Huſbandry.

but in others it will probably be much leſs, eſpecially on the ſhallower ſorts of ſaintfoin ſoils.

It is evident, from the facts that have been ſtated, that this is a plant of vaſt utility to the farmer, not only in providing a full ſupply of fodder for the ſupport of ſtock, but of good green feed for the latter part of autumn, in ſoils that are adapted to its culture, as it is capable of affording a large produce, even on thoſe thin poor deſcriptions of land that under other circumſtances yield only a very ſcanty product either in herbage or hay. And in ſuch as are of the better and more fertile kinds the quantity of crop is incomparably abundant. Its culture ought, therefore, to be extended to all thoſe extenſive tracts of lands in different parts of the kingdom that afford little or nothing under other ſyſtems of huſbandry or modes of cropping, and which are not adapted to the growth of clovers.—This is particularly deſirable, as it is an artificial graſs that ſucceeds well in the ordinary methods of ſowing, without the trouble or expenſe of either the drill or the hoe. It ſeems extremely probable, from different trials that have been made with this plant, that it is not by any means ſo confined in reſpect to ſoil as has been generally ſuppoſed*, though there can be little doubt but that it anſwers beſt on thoſe of the calcareous dry loamy kinds. On ſuch as have had occaſionally applications of lime it has been known to ſucceed in a perfect manner†.

The ſituations that are the moſt unfriendly to the growth of this graſs are thoſe where there is much ſtagnant moiſture in the ſoils, or where they are wet and ſpungy; a conſiderable degree of dryneſs being eſſential to the healthy vegetation of the ſaintfoin plant‡.

The principal inconvenience which crops of this ſort ſuſtain is from the riſing of coarſe graſſes, and weeds of different kinds, as it is theſe that, in a great meaſure, limit the duration of the plants, and not that of their age: the advantage of a proper and clean preparation of the land previous to its being ſown is therefore ſufficiently evident. Where, notwithſtanding every precaution, ſuch graſſes come up ſo as to injure the ſaintfoin, harrowing has been had recourſe to with ſucceſs, when performed to ſuch a degree as to leave the ſurface of the land in nearly the ſtate of fallow§.

Lucern¶. This is another plant of the artificial graſs kind, that may in ſome caſes be cultivated with much profit and advantage, as affording a large produce of ſucculent green food, for the ſupport of different ſorts of ſtock, and likewiſe of hay for the winter fodder of horſes or other cattle.

The ſoils moſt ſuitable to the culture of this plant are all thoſe of the more deep,

* Young's Eaſtern Tour, Vol. IV. † Marſhall's Rural Economy of the Southern Counties.
‡ Young's Eaſtern Tour, Vol. IV. § Ibid. ¶ *Medicago ſativa.*

rich, and drier kinds, as thoſe of the ſound, mellow, loamy, gravelly and ſandy deſcriptions; but on ſuch as are retentive of moiſture it ſhould not be attempted, as the roots are liable to be greatly injured, if not wholly deſtroyed, by the ſtagnation of water about them. Weeping gravelly lands, and all ſuch as are not well drained, are of courſe improper for this ſort of culture. It is ſuppoſed by ſome, that for the ſucceſsful cultivation of this crop, it is neceſſary that there ſhould be a ſubſtratum of ſuch a ſort as is capable of ſtopping the deſcent of the roots at a certain depth, in order to prevent their exhauſting themſelves; but the depth of the mould, in this caſe, ſhould be conſiderably greater than for that of the preceding graſs, a foot and a half or two feet being moſtly requiſite*.

In the preparation of the land the ſoil ſhould always be brought into as fine a condition of mould as poſſible. This may be effected by repeated ploughing and harrowing, and the previous growth of ſuch crops of the green kind as have a tendency to clean and render the land more fine and mellow. In this intention, ſome adviſe the taking of two crops of turnips, carrots, or cabbages, either in ſucceſſion or alternating with each other; the turnips, in the heavier loams, being eaten off upon the land in the ſecond autumn, before it is ploughed up. In either of theſe caſes, from the hoeing and conſtant culture which is neceſſary, while the crops are upon the land, it will be left in a ſuitable ſtate of cleanneſs and friability†. Others recommend fallowing as a better practice, the root weeds of every kind being carefully pricked out in the different ploughings and harrowings. From the great length of time that the ground muſt remain unemployed in this mode of preparation, it is probably, however, only capable of being practiſed with advantage where the lands are heavy and very full of weeds. Before the ſeed is put in, the ſoil muſt be rendered perfectly fine by ploughing it over as frequently as may be neceſſary, and breaking it well down by occaſionally harrowing. It will ſeldom be neceſſary to make uſe of manure; but where the land is found to ſtand in need of it, the application is beſt made with the firſt of the green crops. The object to be conſtantly kept in view in this buſineſs is chiefly that of rendering the land perfectly clean from weeds, and at the ſame time highly mellow and friable.

Seed.—The ſeed of lucern is larger and of a more pale colour than that of clover; and as much of it is brought annually from Holland, it is commonly purchaſed in the ſeed-ſhops, the price varying from one to two ſhillings the pound. As ſeedsmen are apt to keep their ſeeds from year to year, it may be neceſſary to obſerve, that that which is perfectly freſh is the moſt proper for being ſown, as ſmall ſeeds in general vegetate in the moſt perfect manner when new. The proportion of

* Keat's Hints. † Annals of Agriculture, Vol. XXV.

ſeed that is neceſſary is variable, according to the nature of the land and the manner in which the crop is cultivated. In the broadcaſt method, which has been found very ſucceſsful, from eighteen to twenty pounds may be proper, while in that of the drill it will be conſiderably leſs, according to the diſtances at which the operation is performed. In two-feet equidiſtant rows the uſual allowance is about ſix pounds; in thoſe of eighteen inches, about eight pounds; in thoſe of twelve inches, ten or twelve pounds; and in nine-inch rows, which are by much the beſt, from twelve to ſixteen pounds may be neceſſary.

Time and Method of Sowing.—The moſt proper ſeaſon for putting this ſort of crop into the ground is as early as can be done in the ſpring months, as in this way plants may be fully eſtabliſhed before the ſeaſon becomes too hot. The latter end of March for the more ſouthern diſtricts may be the moſt proper period, and the beginning of the following month for thoſe of the north. When ſown late there is more danger of the plants being deſtroyed by the fly, as has been obſerved by Mr. Tull. If the plants be intended to be tranſplanted out in the garden method, it will alſo be the beſt practice to ſow the ſeed-bed as early in the ſpring as the froſts will admit, in order that they may be ſtrong and fit to ſet out about Auguſt.

With regard to the mode of putting in the crop, it ſhould vary with the circumſtances of the ſoil, and the mode of after-management that can be adopted with the moſt convenience. Where much attention cannot be beſtowed in the buſineſs of hoeing and keeping the crop clean, the beſt method is that of ſowing the land broadcaſt; though in this method the crop may not laſt ſo long in the ground. But in caſes where the crops are capable of being kept in a ſufficiently clean condition by repeated hoe culture, the drill may be more adviſable, eſpecially at narrow diſtances. Some, however, think it the beſt method in all caſes*.

The practice of tranſplanting can, perhaps, only be done in particular caſes, or ſmall pieces of deep land that are in great heart, and require the plants in conſequence to ſtand thin and regular upon the ground, as in this mode they become large and of vigorous growth. In ſoils that are inclined to moiſture at ſome depth below the ſurface, it may be an uſeful method of keeping the roots of the plants from being injured by their penetrating too deeply, as is more the caſe when the plants riſe from ſeed†.

The ſeed may be ſown either alone or with grain crops, in the ſame manner as clover: each method has its advocates, and it is probable that they may both be uſeful under different circumſtances, as in the deeper and more fertile ſorts of lands the firſt may be the moſt beneficial method, and in thoſe of the lighter and leſs deep

* Kent's Hints. † Annals of Agriculture, Vol. XXV.

kinds the latter;—as in the deep, rich ſorts of land there may be leſs loſs of time in procuring the green produce for the uſe of horſes or other ſorts of ſtock, as well as the greater certainty of the crop ſucceeding. But in the lighter and more porous ſoils, by being ſown with corn, the plants may be better protected in their early growth, as well by the ſhade as the moiſture that will in that way be preſerved. Some indeed ſpeak of its ſuperior utility, on the ground of long experience, in its being better preſerved from the fly*. Wherever this mode is made uſe of, the grain ſhould however be ſown thinner than is uſually the caſe in proportion as the ſoils are more rich. Oats are preferable to barley for the purpoſe, as being leſs liable to lodge, eſpecially when ſown thin. From five or ſix pecks tot hree buſhels, ſown as evenly as poſſible, may be the beſt proportions, the ſmalleſt quantity being neceſſary on the richeſt ſoils.

After the grain has been ſown and harrowed properly in, the lucern ſeed ſhould be immediately ſown by a regular even caſt over the fine ſurface, covering it in with a light ſeed harrow; but it ſhould not be too deeply covered in, two inches is fully ſufficient. In the drill method the ſame ſyſtem ſhould be followed, the lucern ſeed being drilled in, either lengthways or acroſs, at ſuitable diſtances, immediately after the corn has been put in†.

It is hardly neceſſary to obſerve, that the plats of ground ſown for the purpoſe of raiſing plants to be ſet out in the garden method of culture, ſhould always be without grain or other ſorts of crops, in order that they may admit of having the plants properly thinned out and kept clean, and in a vigorous ſtate of growth for being afterwards put out with the moſt advantage.

In regard to the proper diſtance of the rows where the drill mode of culture is practiſed, it ſhould probably depend upon the ſtate and circumſtances of the ſoils: ſome adviſe two feet as the beſt diſtance in all caſes ‡, while others think equal diſtances of a foot in rich ſoils, ſuch as are worth from thirty to forty ſhillings the acre, and nine inches thoſe that are of inferior fertility, as from fifteen to twenty ſhillings the acre, the beſt general diſtances §. On ſoils of leſs value, it is probable that this culture can ſeldom be had recourſe to with much benefit to the farmer. The laſt diſtance approaches much to the broadcaſt method, which is contended by ſome as the moſt appropriate in almoſt all caſes ‖: of courſe it may be preferable, as it admits of being ploughed between by a ſuitable plough in the room of the harrow.

The ſeed, in whatever method it may have been ſown, is, when good, rather rapid in its vegetation, beginning to ſprout in the courſe of a week, and ſoon ſpreading itſelf over the ſurface of the land. And the ſooner it attains its rough leaf the

* Annals of Agriculture, Vol. XXV. † Ibid. ‡ Kent's Hints.
§ Annals of Agriculture, Vol. XXV. ‖ Ibid.

better, as it is then, like turnips, out of danger of being deſtroyed by the fly. Before theſe plants arrive at this ſtate of growth, they are liable, eſpecially in dry ſeaſons, to be much injured, if not wholly conſumed, by the ravages of the ſame ſort of inſect as that which is ſo detrimental to the turnip plant. Where the greateſt part of the plants are injured in this way, it is probably the beſt method, when the crop has been put in alone, to plough up the land, and ſow it down again with freſh ſeed as ſoon as poſſible. This is an advantage which the practice of ſowing the crop alone has over that of putting it in with thoſe of other kinds.

After-management.—As the economy of this plant is ſuch as to render it incapable of being grown with much advantage where other ſorts of plants, whether of the graſs or weed kind, are apt to annoy it, much care and attention ſhould of courſe be employed in keeping it clean and free from the intruſion of all ſuch vegetable productions. This may be effected in different ways according to the methods in which the crop has been raiſed. Where the broadcaſt plan has been purſued, little is neceſſary where the land has been properly prepared, after the grain crop has been removed, except keeping all ſorts of heavy ſtock from coming upon it. In a dry ſeaſon, if there be occaſion, the field may, however, be fed a little by calves and other very light ſtock, but they ſhould never be kept long upon the plants at one time. When the ſecond cutting has been made in the following year, if any graſs ſhows itſelf, the land ſhould be harrowed over in a moderate manner by a harrow which is not too heavy or too long in the tines, twice or more times, as may be neceſſary, in different directions, the graſſy matter being collected by a ſmall light implement of the ſame kind, and removed from the land. This buſineſs ſhould be executed as ſoon in the early part of the ſpring as the nature and ſtate of the ground will admit, as dry a period as poſſible being taken for performing the work. In the ſucceeding years two ſuch harrowings may frequently be required, one in the early part of the ſpring ſeaſon and the other in the cloſe of the ſummer. But in theſe caſes, eſpecially where there is much graſs appearing, a much heavier ſort of harrow ſhould be made uſe of. Some adviſe one of ſuch weight as is ſufficient for four horſes, and which does not ſpread more than four or five feet*; but in moſt caſes, eſpecially when the buſineſs is ſo frequently done, one that requires leſs draught may be adequate to the purpoſe, as where ſuch large heavy harrows are employed, there is much danger of injuring the crowns of the plants, and thereby cauſing their deſtruction; whereas by the uſe of lighter ones they are moſtly much benefited from the mould being ſtirred about their roots. After theſe harrowings, as in the above caſe;

* Annals of Agriculture, Vol. XXV.

the weeds ſhould be brought together and removed from the ground. Where the crops are thin and patchy, ſeed in proportion to the deficiencies ſhould be ſown over ſuch places before the harrowings commence each time. In every caſe the rollers ſhould be applied immediately after the operation has been performed, not only for the purpoſe of preſſing the mould about the roots of the plants, but to render the ſurface perfectly level and fit for the ſcythe.

In the broadcaſt method of culture, where the produce is not to a conſiderable extent, it is probably better to feed the crop by light cattle ſtock in the autumn than mow it.

In the drill-ſown lucern ſome recommend, where the rows are ſufficiently evident in the autumn ſeaſon, after the grain has been ſecured, the paſſing of a ſmall ſhim between them, in order to extirpate all the weeds and graſſy materials, as well as to looſen the mould about the roots of the plants, and, that they may be rendered more perfectly clean, the hand-hoeing of the plants in the rows*. In the ſucceeding year ſtill more particular attention to the uſe of the ſhim and hoe will be requiſite. The buſineſs ſhould be begun as early as the ſtate of the ſoils will ſafely admit of its being executed; being continued occaſionally in ſuch a manner, during the whole ſummer, as is ſufficient for preſerving the crops perfectly clean and free from all ſorts of weeds. But in order to accompliſh this in the moſt complete way, great circumſpection is neceſſary, immediately after the lucern has been cut, to the extirpation of the natural graſs plants and the weeds of other kinds, as at this period they can be diſcovered and removed with the greateſt facility and diſpatch.

The crops raiſed in the tranſplanted method, as they are put in ſo late in the ſummer ſeaſon, will demand but little regard in the autumn: one or at moſt two ſlight hoeings may be ſufficient for the purpoſe. But in the following year's culture the ſame management will be proper as in the preceding caſe.

Some adviſe it as a good rule in theſe caſes to give full hoeings, either of the horſe or hand kinds, as ſoon as weeds appear, every time after the crops are taken off. If the plants are perfectly ſtraight in the rows, which ſhould always be the caſe, "a ſhim may be had recourſe to with the greateſt benefit, as it may be drawn ſo cloſely to the plants as in a great meaſure to ſave the expenſe of hand hoeing, as in ſuch caſes it will only be neceſſary to extirpate the weeds or natural graſs plants that may have eſtabliſhed themſelves among the lucern plants in the rows, which is capable of being effected in a very complete manner by the uſe of a pronged hand hoe †. It is further recommended by the ſame cultivator, never by

* Annals of Agriculture, Vol. XXV. † Ibid.

any means to ſuffer fields of this ſort to become weedy, under the ſuppoſition that the produce may not cut well, or be free from duſt; as, where it is of ſufficiently vigorous growth, and of a ſuitable diſtance in the rows according to the nature of the land, there can be no reaſon for ſuch an injurious practice; as it is only where the planting is executed at larger diſtances than the condition of the ſoils will permit that any inconvenience can be experienced in this way.

Where hand-hoeing is the method chiefly depended upon for keeping crops of lucern in a proper ſtate of culture, much of the buſineſs may be performed by women, or even children, and the expenſe be thus conſiderably leſſened.

When the ſoils on which this plant is grown are not of conſiderable fertility, the occaſional application of manure may be of great advantage in thickening and increaſing the quantity of crop. For this uſe clean well rotted dung is probably by much the beſt manure, as where earthy compoſts, aſhes, or ſoot are employed, they are apt to promote the growth of, or bring up common graſſes too much. The latter are, however, ſometimes ſown over the crops in the winter ſeaſon. The dung is adviſed by ſome to be applied in the quantity of about twenty tons to the acre every five or ſix years*. Others, however, think it a better practice to put a light coat on annually in the early ſpring ſeaſon †.

The culture of this ſort of crop is obviouſly attended with conſiderable expenſe, both in its firſt eſtabliſhment and the after-management which is neceſſary to enſure its ſucceſs. The inexperienced cultivator ſhould not therefore commence this kind of huſbandry too haſtily, without conſidering how far it may ſuit his circumſtances. The additional expenſes in putting in this ſort of crop, with thoſe of the grain kind, in the drill method, the neceſſary annual charges afterwards, and the produce in the ſupporting of horſes, are ſhown in one view below ‡.

As this is one of the moſt forward of the natural graſſes, it frequently attains a ſufficient growth for the ſcythe towards the end of April or beginning of the fol-

* Annals of Agriculture, Vol. XXV. † Kent's Hints.

‡ *Extra Expenſe.*

	£.	s.	d.
Two ſpring ploughings extra, are	0	18	0
Harrowings	0	2	6
Eight pounds of ſeed	0	8	0
Drilling	0	2	6
Horſe-hoeing in autumn	0	2	6
Hand-hoeing ditto	0	5	0
First year	£. 1	18	6

lowing month, and in ſoils that are favourable for its culture will be in a ſtate of readineſs for a ſecond cutting in the courſe of a month or ſix weeks longer; being capable of undergoing the ſame operation at nearly ſimilar diſtances of time during the whole of the ſummer ſeaſon. In this laſt ſort of ſoil, with proper management in the drill method, it has been found to riſe to the height of a foot and a half in about thirty or forty days, affording five full cuttings in the ſummer*. But in the broadcaſt crops, in the opinion of ſome, there are ſeldom ſo many cuttings afforded in this ſeaſon, three or four being more common, as the growth is ſuppoſed to be leſs rapid than by either of the other modes. This is, however, contradicted by the experience of other cultivators who have paid much attention to the ſubject, as will be ſeen below. In order to have new ſucceſſions of this graſs conſtantly becoming ready to be cut, it has been recommended, for the purpoſe of ſoiling, to have the broadcaſt plantations formed into ſo many diviſions as that one of them may be cut daily; as about ſixty, and thoſe of the drilled and tranſplanted kinds into from thirty to forty, according to the nature of the land, conſuming them in the ſame manner †. Theſe cuttings muſt however be varied in proportion to the differences in the growth of the crops and the conſumption. The moſt economical mode of cutting the produce is without doubt by means of the ſcythe, though the reaping-hook has been made uſe of by ſome. After being cut, the food ſhould be conveyed as ſoon as poſſible to the animals. This may be done by a light cart, or large barrow, made for the purpoſe, according to the ſcale on which the buſineſs is conducted. One cutting only in the day is adviſed by ſome; but as there is a loſs as well as injury done to all ſorts of green cut food by keeping even for a few hours in hot ſeaſons, it may be a better practice to have two cuttings in the day, eſpecially when

Annual Expenſes.	£.	s.	d.
To rent, tythes and rates	1	10	0
Four horſe-hoeings	0	10	0
Three hand-hoeings	0	12	0
Five mowings	0	12	6
Raking together	0	5	0
Loading and carting home	0	7	6
Manuring to amount per annum	0	12	0
	4	9	0
Clear profit	9	18	6
	£.14	7	6

Profit by ſoiling Horſes.	£.	s.	d.
By keeping five horſes from beginning of May to middle of October at 2s. 6d. per horſe per week	14	7	6
	£.14	7	6

* Annals of Agriculture, Vol. XXV. † Ibid.

the weather is warm, and the lucern at no great diſtance. Beſides, the food is eaten better when given quite freſh.

The produce of this ſort of crop in converting it to the purpoſes of ſoiling cattle muſt neceſſarily be different under different circumſtances; but an acre can ſeldom when under proper culture and management, ſupport leſs than from three to five or ſix horſes or other cattle during the ſix ſummer months; the profit of which cannot be leſs than from ſeven to ten or twelve pounds.

And in letting it remain for hay, which is leſs advantageous, in the three mowings an acre where the crop is good will ſeldom afford leſs than from three to five tons of dry hay. In Mr. Arbuthnot's trials, the produce was four loads, but in thoſe of others on rich grounds it was five. In making this ſort of plant into hay the ſame directions ſhould be attended to as for clover; the leſs the produce is ſhaken about, the better, provided it be ſufficiently quickly dried; as the leaves will be more fully preſerved on the ſtems, and the hay of courſe more valuable. From its greater ſucculence it will in common require rather more time than clover or ſaintfoin in making. As this ſort of hay is held in leſs eſtimation than that of either of the above graſſes, it ſhould be conſumed at home by the farm horſes or other ſtock, and that of other ſorts ſent for ſale.

In the application of the crop the principal and obviouſly the moſt advantageous practice is that of ſoiling horſes, neat cattle, and hogs. But as a dry fodder it is alſo capable of affording much aſſiſtance in many caſes. And as an early food for ewes and lambs, it may be of great value in particular caſes. As this plant bears repeated cutting better than moſt of thoſe of the artificial graſs kind, ſprings in a more quick and expeditious manner, and affords a healthy nutritious food, in ſoiling it muſt be of vaſt utility to the farmer where horſes and cattle form a large part of his ſtock. With horſes, in this way, it has been found by ſome to anſwer better than any other ſort of green food that has been tried—the number of cuttings that it admitted of being on different ſoils and under different modes of culture, from about three to five, affording a produce of green herbage adequate to the ſupport of from three to four or five horſes for a period of nearly ſix months in the ſummer ſeaſon. And though much of this vaſt advantage, in the ſupport of theſe animals, may with propriety be aſcribed to the economy of the conſumption of the food that unavoidably takes place in this excellent practice*, the real produce in green food is without doubt larger than in moſt other graſs crops. The broadcaſt crops in the trials

* Young's Eaſtern Tour, Vol. IV.

of ſome cultivators appear to have been more profitable in this mode of conſuming the produce than thoſe of either the drilled or tranſplanted methods of culture. In the practice of Mr. Hall, the former ſupported from four to five horſes for twenty-ſix weeks, while the crops tranſplanted in rows two feet aſunder only afforded produce ſufficient for the keeping of three. And in thoſe of Mr. Clayton, in the broadcaſt without grain, five horſes were kept from the middle of May till Michaelmas, while that drilled in equidiſtant rows, at the diſtance of eighteen inches, only ſupported four *. There are many other facts that lead to the ſame concluſion.

On very rich ſoils the drilled lucern will, without doubt, when the plants are kept perfectly clean, and the mould well ſtirred between the rows and laid to their roots afford an abundant produce, perhaps more ſo than in the broadcaſt, but to do this great attention in the culture muſt be beſtowed.

In its application in the ſoiling of cows and other ſorts of cattle in the fold-yards, and in the feeding and fattening of oxen, its importance is equally great. It is found that in ſoiling cows, the proportion of this ſort of food conſumed, in twenty-four hours, is from about ſixty or ſeventy to upwards of a hundred pounds, in thoſe which are of the middling-ſized kinds; an acre maintaining in the proportion of about four for twenty weeks. In other trials larger proportions of ſtock have been kept by this practice. In feeding cattle with this ſort of food in its green ſtate, care is neceſſary, however, not to give the animals too largely at a time, eſpecially when it is moiſt, as they may be *hoven* or *blown* with it in the ſame way as with clover.

The trials in fattening bullocks, or other cattle, with this green fodder are not numerous; but they are ſufficiently ſo to prove its utility in ſuch application. In Mr. Young's trials, cattle were found to increaſe faſt in fleſh by it, paying at the rate of four ſhillings and ſixpence a head per week, which is conſidered as a great proof of the value of the plant: in this view its ſuperiority to tares he thinks prodigious †. It has alſo been conſidered of great value in this view in Ireland, by Mr. Herbert, after much experience. The great power which it poſſeſſes in fattening is, indeed, rendered ſufficiently evident, by the ſudden effects which it produces in ſoiling horſes. In moſt inſtances they get into high condition in a ſhort time, becoming "fat without oats or hay" in ſome caſes ‡.

Sheep have likewiſe been fattened on this green food with great ſucceſs in Mr. Baldwin's trials §.

* Young's Eaſtern Tour, Vol. IV. † Annals of Agriculture, Vol. XIV. ‡ Ibid. Vol. XXV. § Ibid.

In ſoiling hogs in the fold-yards it has alſo been attended with conſiderable ſucceſs. And it has been ſuggeſted, that as theſe animals do not bite ſo cloſely as ſheep, they may be admitted upon the crops with greater ſafety. A plot of it contiguous to the yards might in this view be highly beneficial*.

It is ſufficiently clear, from theſe ſtatements, that this is a highly beneficial method of diſpoſing of lucern crops. Its vaſt ſuperiority over that of making them into hay, as well as the expenſe, product, and neat profit in cultivating them on different ſoils, may be ſeen at one view in the following table †.

The utility and application of the hay produced from this graſs has been already mentioned.

The reſult of the comparative experiment, made by Mr. Anderdon, with this crop and thoſe of burnet and ſaintfoin, ſhows its great ſuperiority over them ‡.

Though crops of this ſort ſhould not, by any means, be fed cloſe with ſheep ſtock, it is probable that, in particular caſes, they may be applied as an early green feed for ewes and lambs with great utility and convenience, as they may be re-

* Annals of Agriculture, Vol. XXV.

† Soils.	Application.	Expenſes.			Product.			Profit.		
		£.	s.	d.	£.	s.	d.	£.	s.	d.
Averages of 5 crops. Light ſandy loam	Soiling	1	14	6	13	0	0	11	5	6
Rich black loam	Hay	5	0	8	11	5	0	6	4	4
Good loam	Soiling	3	15	0	14	7	6	10	12	6
Good loam	Soiling	3	3	6	9	0	0	5	16	6
Rich deep ſandy loam	Soiling	3	11	1	7	0	11½	3	13	11½
Averages		3	8	11	10	18	8	7	10	5

‡ Lucern at four cuttings green, produced ..... lbs. 159

Burnet 84

Saintfoin 112

The diſadvanges of making them into hay ſtand thus:

lbs.		lbs.
Lucern in graſs 57⅓	..... in hay	22
Burnet in ditto 25½	..... in hay	7
Saintfoin in ditto 29½	..... in hay	9

One cutting of each.

Theſe facts fully ſhow the great loſs and diſadvantage of employing in the way of hay the more ſucculent ſorts of vegetable productions that are capable of being cut and ſoiled in their green ſtate.

lied on for this ſort of ſeed much ſooner than any other kinds of artificial graſs crops, eſpecially in ſoils of the rich, dry, and warm deſcriptions; being often ready for the purpoſe ſoon after the middle of March, affording a good bite through the whole of the following month, the moſt difficult period for the providing of ſuitable ſupport for this kind of ſtock. The benefit produced in the healthy growth and improvement of the lambs in this mode, will much more than counterbalance any loſs ſuſtained in the firſt cuts for ſoiling of horſes. The ſheep ſhould not, however, remain on longer than while the firſt ſhoots are eaten down.

On the whole, though this plant is capable of being thus uſefully applied, conſidering the very great expenſes which are neceſſary in raiſing and keeping lucern crops in a ſtate of production, and their affording but little produce, eſpecially when ſown without corn, for the firſt years, notwithſtanding they appear to yield a great advantage in the practice of ſoiling animals, it is probable that much of the profit depends upon the method of conſuming them, and not on that of the particularly advantageous nature of the plants. Its ſuperiority to clover, when the differences in the expenſes of their culture and other circumſtances are fairly brought into view, will not, perhaps, appear ſo great as many on a ſuperficial obſervation may have ſuppoſed. The point in which it moſt materially excels that invaluable plant is the duration, or time which it laſts in the ground, after being once introduced; continuing from ten to fifteen and even twenty years, according to the ſtate and nature of the ſoil, and the attention that is beſtowed in the after-management. This is, undoubtedly, a circumſtance of the firſt importance, in caſes where the cultivator wiſhes to avoid the trouble and expenſe of grain crops, as he can keep a ſuitable extent of land under this crop for the purpoſe of ſoiling his ſtock without them, whle with clover it is utterly impoſſible *. Where the proportion of land is ſmall, and the quantity of cattle and horſe ſtock diſproportionately large, it is a plant admirably calculated for the cultivator's purpoſe, when grown conveniently to the farm yards and kept in due order by proper cultivation. It has alſo been recommended on dairy farms as of great utility in ſupporting the cows and increaſing the quantity of milk †. Where the ſoils are ſuitable, a few acres under this graſs round the houſe muſt in almoſt all caſes be valuable for the purpoſe of early green food.

On attempting to break up lands that have been long under this ſort of crop, it has been ſometimes found from the great ſtrength of the roots of the lucern plants, and the conſequent difficulty of deſtroying them, that the crops have been reſtored in

* Young's Eaſtern Tour, Vol. IV. † Annals of Agriculture, Vol. XXV.

ſuch a manner as to induce the cultivators to leave it again for the production of this graſs*. In ſituations where ſuch grounds could be conveniently flooded, or covered with water occaſionally, they might, therefore, be very advantageouſly converted into good meadow or graſs lands; a ſort of application that has long ſince been recommended by a French writer †.

When ſuch lands are perfectly broken up, they afford, in moſt caſes, admirable crops of the grain kind. Oats, as being the leaſt injured by a luxuriant growth, may in general be the moſt adviſable as the firſt crop.

The nature, cultivation, and modes of applying different ſorts of artificial graſſes in the feeding of live ſtock being explained, we ſhall conſider a few other plants of the herbaceous kind, which ſeem properly to belong to this place, from their great importance and uſe in affording plentiful ſupplies of green food for the ſupport of cattle or other ſorts of live ſtock.

Tare ‡.—This is a plant which, from its tall, cloſe, hardy growth and ſucculent nature, is capable of being introduced with vaſt advantage in the manner of thoſe of the artificial graſs kind, between different ſorts of grain crops, with the view of preventing the fertility of the land from being too much expended, and at the ſame time procuring an uſeful ſupply of green or other fodder for the conſumption of horſes or other deſcriptions of ſtock. It has indeed been contended by an intelligent cultivator §, that it "may be made the means of enabling the arable farmer to ſupport as much live ſtock as the grazier," as while crops of this ſort remain upon the ground they afford larger ſupplies of the beſt kind of green food on the acre, than the moſt rich and fertile graſs lands; and they may be taken from the ground at ſo early a period in the ſummer ſeaſon as, on the friable loamy ſoils, to admit of a clean crop of turnips being obtained from the ſame land in the ſame year, and of thoſe of the more heavy kinds being ſown with wheat. And while they are capable of being raiſed with ſucceſs on moſt kinds of ſoils and ſituations, they ſupport and fatten cattle and ſheep of different ſizes and breeds in an expeditious manner. Beſides, they afford a good preparation for other ſorts of green crops, and in that way keep up the ſucceſſions of ſuch kinds of food for the fattening of additional quantities of animals; and in that way produce abundance of manure in ſituations where it could not otherwiſe be procured. In ſhort, he ſuppoſes that by a judicious combination of this plant with thoſe of turnips, clover and ſaintfoin,

* Young's Annals, Vol. XXV.

† De Serrès en Théâtre d'Agriculture, p. 442.

‡ *Vicia ſativa.*

§ Mr. Middleton.

the poor downs, ſheep-walks, and other waſte lands, may be rendered from ten to thirty times more valuable than they are at preſent.

But, however ſanguine theſe obſervations may be, there cannot be any doubt but that the tare may be an uſeful object of cultivation in the view of improving the land, as well as the ſupporting of a larger ſtock, and a plant that ought to be more generally grown in moſt ſituations, in proportion to the extent of the ſtock that is kept.

The common tare is diſtinguiſhed by writers on huſbandry into two ſorts,—the *winter* and *ſpring* tare: the latter is probably a variety of the above ſpecies. It is, however, much leſs hardy in its habits than that of the former or ſpring kind; the plants when wholly of this ſort being capable of reſiſting the effects of the ſevereſt winter ſeaſons in this climate.

In cultivating theſe plants, with a view to aſcertain their difference in reſpect to hardineſs, the Rev. Mr. Laurents of Bury, in Suffolk, is ſtated by Mr. Young to have made the following experiments:—On the 30th of September 1783 he ſowed ſeeds of the winter tare and of the ſpring tare near to one another, in the ſame ſoil and expoſure, and covered both with a coat of crumbled mould one inch deep. The weather proving mild, the ſpring tare ſoon made its appearance; and two days afterwards the winter tare came up. This aſcendency the former did not fail to maintain over the latter until the middle of December; at which time that was about ſix inches high, and this not above four. They were both in a vigorous and thriving condition when a froſt came on and continued for ſome weeks. On a thaw taking place, he found the ſpring tare lying on the ground, ſlimy, and putrefied to the very root. The winter tare had received no damage. It grew up afterwards, and was ripe before the middle of Auguſt.

This difference in the effects the froſt had on them, led him to view the ſtate of tares in more open ſituations; where he found that in ſome grounds ſcarce any plants had been deſtroyed, in others patches of ſomething in a ſtate of putrefaction, reſembling the dead tares in his garden, were obſerved.

And on the 6th of March 1784, both ſorts were again ſown in the manner deſcribed above; and in their ſpringing up and growth, a progreſs ſimilar to that which he had remarked in autumn was obſerved. Near a week later than the winter tare of the autumnal ſowing, the ſpring tare of the vernal ſowing arrived to perfect maturity. But the winter tare of the vernal ſowing was mildewed, not a ſingle pod of it ripening.

From theſe two circumſtances there appears a material difference in the con-

ſtitution, if he may ſo call it, of the two ſorts of tares in queſtion. He adduces nothing as to the trifling difference in the colour and ſize of their ſeeds, but paſſes on to the only viſible marks of diſtinction he was able to trace in watching the proceſs of the two experiments. And this is a diſparity in the firſt leaves of the upper part of the ſtalks of the plants when gathered about the end of November, while the leaves on the branches, which afterwards iſſue in the lower part, and in time form the bulk of the plants, reſemble one another in the two vetches. This is all he has been able to offer towards the deciſion of this point. Theſe differences may be ſeen by conſulting a plate in the ſecond volume of the Annals of Agriculture.

It has been obſerved by the author of the Synopſis of Huſbandry, that "the ſeeds of the winter and ſpring tare are not eaſily diſcriminated, being nearly alike in ſize and every other characteriſtic; but on the appearance of the blade the difference is at once to be perceived. The winter tare vegetates with a ſeed-leaf of a freſh green colour, whereas the ſpring tare comes up with a graſſy ſpear of a brown duſky hue."

There is likewiſe a ſecond variety which is denominated the *white* tare, but it is tenderer than even the ſpring tare, of courſe ſeldom employed in field culture.

The tare is a plant which in reſpect to ſoil admits of conſiderable latitude, growing without difficulty on all the varieties, from the thin gravelly to thoſe of the deep and ſtiff clayey kinds, but flouriſhes in the moſt vigorous manner on thoſe gravelly loams* that are not too moiſt.

In the preparation of the land for this crop leſs care is neceſſary than for many other ſorts of graſs crops, as it will ſucceed well where the ſoil has not been much broken down or reduced into fine mould; but it always grows in the moſt perfect and vigorous manner where a degree of fineneſs has been produced in the land. Two ploughings, with occaſional harrowings in the intermediate times, may in general be ſufficient for the purpoſe at whatever ſeaſon the crop is put in. They are ſometimes ſown on one ploughing, eſpecially the winter crops; but the practice is not to be recommended, eſpecially on the ſtronger ſorts of ſoils. In ſuch ſoils as are not rich it is a good practice to manure for this crop†.

Seed.—As the ſeed of the ſpring tare does not ſucceed well when ſown for the winter crop, nor that of the winter kind when put in for the ſummer produce, care ſhould be taken to keep the ſeed of the two ſorts as perfectly diſtinct as poſſible. And as they are, from their being both of nearly the ſame colour and ſize as well as

* Modern Agriculture. † Suffolk Report.

their agreeing in other particulars, liable to be mixed in the ſeed-ſhops, it may be the beſt practice for the cultivator to preſerve his own ſeed, as by that means he may not only be certain of having the ſeed good in its quality, but of the right ſort, and of courſe may depend more fully on his crops.

It has been ſuggeſted that ſteeping the ſeed in dry ſeaſons may be of utility in promoting the quick vegetation of the crop*.

The quantity of ſeed ſhould vary according to the nature of the ſoil and the method of ſowing. From two buſhels to two and a half are the proportions recommended by ſome in the broadcaſt method. Others adviſe three buſhels; but on medium ſoils in the middle of the ſeaſon the former may be fully ſufficient. Where the land is more rich and the ſeed put in early, leſs may anſwer the purpoſe; but on poor ſorts of land, where the ſeed is ſown late and the climate is backward, the latter quantity may not be too much. In the drill mode, at ſix inches, two buſhels are enough. When the crops are either to be cut for ſoiling or to be fed down, the proportion of ſeed ſhould be increaſed, as not only a greater produce is thereby provided, but the growth of the crops rendered more quick.

Time and Method of Sowing.—The periods of ſowing tare crops vary with the intentions of the cultivator, but the winter ſowings ſhould be performed ſome time between Auguſt and October: in late expoſed ſituations and poor ſoils more early than in thoſe of the contrary. In the former the beginning of Auguſt may not be too early†. In other caſes the latter end of that month or the beginning of the following may be better. It ſhould, however, for the general crop always be done in ſuch time as that the plants may be perfectly eſtabliſhed in the ſoil before the cold ſeaſon begins, as by this means the crops ſucceed better. For the ſpring ſowings, from the beginning of March to the end of April may anſwer very well; but the ſooner the better, as the plants will have got the more firm hold of the ground before the hot ſeaſon ſets in. It is of great advantage in providing a due ſucceſſion of green food for the ſpring conſumption to ſow at different periods in the autumn.

The method of ſowing is moſtly that of the broadcaſt, which ſhould be performed as evenly as poſſible over the ſurface, the ſeed being afterwards well covered by harrowing, in order to prevent their being picked up by birds, and enſure their perfect vegetation. In rich clean ſoils it is probable, however, that the row method would ſucceed well at ſix or eight inches with this ſort of crop, as is the caſe in ſome of the ſouthern diſtricts‡. With ſome intelligent cultivators it is the cuſtom to ſow a little

* Corrected Report of Middleſex. † Ibid. ‡ Synopſis of Huſbandry.

rye with their winter tare crops, and a ſmall quantity of barley with thoſe of the ſpring. But as plants of different ſorts never ſucceed well together, it is probable that little advantage can be derived from the practice, eſpecially as the tare is not a plant that ſtands much in need of protection in the early ſtages of its growth, and may be injured by too much ſhade.

Crops of this ſort are moſtly cultivated after wheat or barley; but they may be grown after almoſt any kind where the land is in good heart.

After-management.—As this ſort of crop covers the land in a very complete manner where it is ſufficiently full, it does not require ſo much attention during its growth as many others. Some nice cultivators, however, make a point of hoeing up and drawing out all the more coarſe and rank kinds of weeds that are in danger of doing injury to the tare plants, and which they cannot ſmother and overpower. This buſineſs ſhould be performed as early in the ſpring as poſſible. And in order that the land may be in better order for the ſcythe, a light roller may be paſſed over the crops when the ſeaſon is tolerably dry in the very early ſpring months*.

When the parts of crops of this ſort that have run to ſeed, or any others, are left for the purpoſe of a ſupply, it is the uſual practice to cut and *wad* them in the ſame manner as for peas, in order to their being afterwards houſed or ſtacked, and threſhed out in the winter ſeaſon.

In making tares into hay, more attention is neceſſary than in thoſe of moſt of the artificial graſſes, as wet is more injurious to them, and they require more ſun and air; but in other reſpects they demand the ſame cautious management in order to preſerve the foliage from being loſt. The time for cutting for this purpoſe is when the bloſſoms have declined, and they begin to fall flat†. When well made the hay is of the moſt nutritious quality. The produce in tare crops, as in thoſe of other ſorts, muſt be different according to circumſtances; but when they are good, in the winter kinds it is commonly conſiderable. The writer of the Report of the State of Agriculture in Middleſex ſtates it as the reſult of experience, having frequently weighed green tares, to be twelve tons per acre; and when made into hay, at about three tons;—the value of the produce, eſtimating it as if the whole were made into hay, being in that diſtrict from twelve to fifteen guineas the acre, and in places where other ſorts of hay ſell at fifty ſhillings or three pounds, at from ſeven pounds ten ſhillings to nine pounds. The ſpring tare crops are in general lighter, and more liable to be injured by a dry ſeaſon than the winter.

* Report of Middleſex. † Synopſis of Huſbandry.

The produce in ſeed is likewiſe conſiderable: by ſome it is ſtated at from three to ſix ſacks*; in other inſtances forty buſhels or more have been obtained from the acre. This ſort of ſeed is greatly preferred by pigeons, and it may probably be uſed for poultry with advantage. In the above ſtatements the produce in green food is undoubtedly large; but from the ſucculent nature and luxuriant growth of the crops it cannot probably be much too high.

In the application of tare crops, there can be little heſitation in pronouncing that of ſoiling them with horſes or other ſtock on the farm, as the moſt advantageous and beneficial method. The vaſt advantage of this mode is rendered particularly evident by the great loſs which we have juſt noticed in converting them into hay. In the practice of ſoiling much loſs may be ſuſtained by cutting the tares at too early a period†.

An intelligent agricultor is of opinion that the farmer's ſtock ſhould be wholly ſupported on them from the time they begin to blow till the bloſſoms begin to fall off, and the formation of pods takes place. On account of the riſk from wet, he recommends that all the ſtock of a farm ſhould be ſoiled on them green, as it will have the good effect of taking it off the graſs land long enough to allow of its being mown for hay; and by this means the meadow hay be much increaſed in quantity, and there will not be ſo much occaſion for paſture, the tares abundantly ſupplying its place. Beſides, at the time the cattle return from green tares, the graſs land, in the mean time having been mown, may be ready to receive them‡.

It is further obſerved that, as it would be waſteful in the extreme to turn live ſtock into a field of tares, as their treading and lying down would do great miſchief to the crop, even by feeding it in ſmall patches hurdled off, the moſt adviſable method would be to mow the tares of the firſt half acre, and to carry the produce into the ſtables, cow-houſes, and fold-yards, or on to poor land to be conſumed by ſtock, then to hurdle the growing tares from ſuch *cleared ground*, into which put the ſtock and feed them all with the tares, given to them in racks, removing the hurdles and the racks forward daily to the edge of the growing tares; which will manure the land uniformly, and depoſit all the urine in the ſoil§.

In the Glouceſter Report another good method is recommended, "which is to feed them through rack hurdles, which are made the ſame as the common five-railed ones, only leaving the middle rail out, and nailing upright pieces acroſs, at proper diſtances, to admit the ſheep to put their heads through. A ſwath of vetches.

* Suffolk Report. † Ibid. ‡ Middleſex Report. § Ibid.

being mown in the direction you wish to plough the land, a sufficient number of these hurdles, allowing one to five sheep, are set close to it: at noon the shepherd mows another swath and throws it to the hurdles, and the same at night; next morning, a swath being first mown, the hurdles are again set: thus moving them once in the twenty-four hours, by this trifling additional trouble the vetches are eaten clean off, and the land equally benefited."

In Gloucestershire and Worcestershire they sow tares as pasturage for horses, and eat them off early enough to allow of turnips being sown the same season *. In wet seasons, where the tare crops are large, the stems are, however, apt to become rotten upon the ground; in this condition such food often proves prejudicial to horses; in such cases it will therefore be imprudent to cut them any longer for the purpose of soiling †.

In Sussex tares are of such infinite importance that not one-tenth of the stock could be maintained without them: horses, cows, sheep, hogs, all feed upon them. The last sort of animals are soiled upon them without any other food. This plant maintains more stock than any other plant whatsoever. Upon one acre Mr. Davies can maintain four horses in much better condition than upon five acres of grass. Upon eight acres he has kept twelve horses and five cows for three months without any other food: no artificial food whatever is equal to this excellent plant. They find this crop to be a hearty and most nourishing food for all sorts of cattle. Cows give more butter when fed with this plant than with any other food whatsoever.

By one crop of vetches succeeding another, Mr. Halstead, in the same district, insures a crop the whole summer of the best food that can be given to cattle; after this he sows turnips, then wheat ‡.

Where large stocks of sheep are kept, tares are exceedingly useful; for they come in at a time when rye and turnip crops are eaten off, and before the clovers and other grasses are in sufficient forwardness for being turned upon, and afford a seasonable supply of food for ewes and lambs. It is recommended to wait till the tares have gained a sufficient increase of stem before the sheep are turned in, and then to divide the ground by hurdles, in the same manner as is practised above. By this means there will be little waste, and the ground be enriched in a much higher degree than if the stock had been suffered to ramble over the whole crop §.

As from the great closeness and shade which is produced in these crops the land becomes much improved and rendered more clean and mellow, such plants

* Withering's Botanical Arrangement, Vol. III. p. 622. † Synopsis of Husbandry.
‡ Annals of Agriculture, Vol. XXII. § Synopsis of Husbandry.

ſhould conſtantly be cultivated wherever the ſoils and ſituations will admit, eſpecially if the keeping of much live ſtock be the object. In cold expoſed ſituations, where vegetation is late in the ſpring months, they are not ſo proper: it may ſometimes under ſuch circumſtances be more adviſeable to raiſe clover crops, as it will not be ſo much later as to render it much leſs valuable, and at the ſame time be more certain *.

Tare crops form an excellent preparation for wheat in all the more ſtrong and heavy ſorts of ſoil, and for both grain and turnips in thoſe of the light kinds; but as they have much effect in rendering the lands on which they grow more light, open, and porous, they may ſometimes, in the latter caſe, bring it into too looſe a ſtate for the ſucceſsful culture of that crop, as it requires a rather cloſe texture of the land.

There are other ſpecies of this genus of plants that may, probably, be introduced into cultivation with benefit to the farmer, either in the view of affording good paſturage, or as ſupplying large quantities of green food, though they have not yet been ſufficiently ſubjected to the teſt of experiment either in the ſoiling, feeding, or paſturing of animals, to fully decide on their merits or utility.

The Buſh Vetch (*Vicia ſepium*) is a ſpecies of tare that promiſes much advantage as a paſture plant. Its roots are ſaid to ſpread much laterally juſt below the ſurface, and to ſend forth numerous ſtems in the ſpring of the year cloſe to each other; which, as they have a broad-tufted top covered with many leaves, a cloſe pile is formed without any other plant. It does not riſe to any great height; but from its ſpringing up very quickly after being cut or cropped, it ſeems to be properly adapted for paſturage. On fertile ſoils, however, it grows to a ſufficient height for the purpoſe of hay. As the ſtalks grow ſo cloſely together, there is, however, danger of its rotting at the root in moiſt ſeaſons. Though it produces abundance of ſeeds, they are very apt to be deſtroyed in the pod by inſects in their vermicular ſtate. It appears to ſucceed beſt in clayey ſoils, and abounds pretty much in foliage, affording ſeeds ſimilar to thoſe of the common tare †. It has been obſerved to ſhoot earlier in the ſpring than any other plant eaten by cattle, and to vegetate late in the autumn, continuing green all winter. A ſmall ſpace in a garden was ſown with it in drills, and in the ſecond year cut five times, producing at the rate of twenty-four tons per acre of green food, which would be nearly four and a half tons when dry ‡.

The chief difficulty in the introduction of this plant ariſes from the cauſes ſtated below.

* Modern Agriculture, Vol. II. † Anderſon's Eſſays, Vol. II.
‡ Bath Papers, Vol. III.

Mr. Swayne has remarked that, though very palatable to cattle, great difficulty arises in the cultivation of it on a larger scale, from the *larvæ* of a species of *attelabus* frequently devouring the seeds *.

And the Tufted Vetch, (*Vicia cracca*) from its rising to a considerable height in the stem and affording much foliage, might likewise be useful for the purpose of eating as a green fodder, as the produce would be considerable, and the plant is easily cultivated. It would also yield a great deal of hay. It has been observed to improve the condition of poor lean cattle beyond any other plant †.

The Everlasting Pea (*Lathyrus latifolius*) is also a plant which, from its large growth and foliage, might afford large supplies of green food, or of hay. A gentleman of much experience lately assured me that cattle eat it with great avidity, and that it is highly nutritious; and it has been long ago suggested as capable of being cultivated with advantage for these uses by Dr. Anderson.

We wish to draw the attention of the farmer more particularly to plants of this kind, as they are not only in general extremely productive in respect to quantity of food, but, in all the trials which we have been enabled to make upon them, very nutritious and fattening. And, in addition, they have mostly the very desirable property of being eagerly fed upon by most sorts of live stock. It is not to be hastily supposed, from their appearing of a coarse nature, that they may not be of advantage even in pastures, as it is now well known that close and judicious feeding can effect much in rendering the coarsest kinds of herbage more fine and grassy.

Chicory ‡. This is a herbaceous plant of the succulent perennial kind, that has been lately introduced into cultivation for the purpose of affording green food for the summer support of different sorts of live stock. It seems to have been first fully brought to the notice of agricultors by the experiments and observations of Mr. Young, detailed in his very useful work, the Annals of Agriculture. The plant is, however, supposed by Professor T. Martyn, in his edition of Miller's Dictionary, to be a highly improved variety of common succory; as in its wild state that plant is dry, hard, and without much succulence. It is capable of being grown on most of the loamy descriptions of soils, and even in some of the more light brashy sorts of lands, and other poorer kinds, but succeeds the most perfectly in such as are not too much retentive of moisture.

In respect to the preparation of the soil, it is probably less particular than many

* Withering's Botanical Arrangement, Vol. III. † Plott's Natural History of Staffordshire, p. 204.

‡ *Cichorium Intybus.*—It is likewise known by the title of Wild Succory.

other ſimilar plants, but anſwers in the beſt manner where the land is in a tolerable ſtate of fertility, and has been rendered in ſome degree fine and mellow. When it is put in with other ſorts of crops the ſame kind of preparation muſt be employed; but when ſown alone the ground ſhould be rendered fine by two or more ploughings, at ſuitable ſeaſons, according to the nature of the ſoil, and repeated harrowings.

Seed.—This is beſt when collected from the plants by the cultivator, as, like moſt other ſorts, it is liable to be mixed in the ſhops. It vegetates in the moſt perfect manner when new.

The quantity of ſeed which is neceſſary for the acre muſt, as in other ſorts of crops, of courſe vary, according to the nature of the land and the intentions of the farmer; but the uſual proportion, whether ſown alone or with grain in the ſpring, is from ten to twelve pounds. In the row method of ſowing, at the diſtance of a foot, from ſeven or eight to ten pounds may, however, be fully ſufficient. As the plant is not of the tillering or ſpreading ſort, a full proportion of ſeed ſhould, however, conſtantly be put in, that the ground may be well covered with herbage.

Time and Method of Sowing.—The period of putting in chicory crops muſt be regulated by the method in which the buſineſs is performed, and the views of the cultivator. When it is ſown without other ſorts of crops, the work may be executed at any time from about the middle of March till the latter end of the ſummer; but with corn it muſt depend on the ſeaſon they are put in. It is ſown with both oats and barley, but the firſt will obviouſly admit of the more early ſowing. From the plant being hardy, it ſhould, probably, be put into the ſoil as early in the ſpring as poſſible. Mr. Young found it leſs liable to be injured by grain crops than other ſorts of graſſes, and to ſucceed well with moſt of them.

It is moſtly ſown in the broadcaſt method, after the ſurface has been rendered fine and covered in by a light harrowing. But from its growing with the greateſt luxuriance where it is the moſt open and has the greateſt benefit of free air, it is ſuggeſted as well adapted to the row method of cultivation *.

After-management.—Where the crop has been put into the ground in the manner directed above, little attention is neceſſary afterwards, eſpecially when cultivated in the common broadcaſt method; but where drilled in rows, the uſe of the hoe will be required to keep the intervals as well as the plants in the rows clean, and the ground well ſtirred.

Crops of this plant, from the great quickneſs and luxuriance of their growth,

* Annals of Agriculture.

are capable of being repeatedly cut in the ſummer months, for the purpoſe of ſoiling horſes and other ſorts of ſtock. It ſhould not, however, be cut more than once or twice the firſt ſeaſon, but in the following ſummers the operation may be performed three or four times, according to circumſtances. Mr. Young adviſes four cuttings, in order to prevent the ſtems from running up too much and becoming dry, ſticky, and leſs nutritive *.—The proper times are to begin about April or May, and to continue it every other month till October.

Its produce when cut green is larger than that of either of the two preceding plants, affording, in Mr. Young's trials, upon the average of four years, thirty tons to the acre: this is probably, however, a larger produce than the plant is capable in general of affording.

It is only in favourable ſeaſons that this coarſe juicy plant can be made into hay with ſucceſs; nor is it well ſuited for the purpoſe, being of much greater advantage when conſumed in its green ſtate. Its produce in this way is ſtated at from three to four tons the acre †. This ſort of hay is, however, aſſerted to be nutritious.

When left to run up to ſtem and ſeed the produce is conſiderable, amounting in the third year to more than four hundred weight on the acre.

The moſt uſeful application of this ſort of crop is probably feeding of cows and other ſorts of cattle, and the ſoiling of theſe as well as horſes, as it ſprings more rapidly than either ſainfoin or burnet; but it is likewiſe found to anſwer admirably for paſturage for ſheep, as it is leſs injured by cloſe feeding than many other plants ‡.

"In a comparative experiment made on a ſmall piece of land of a wet, ſandy, friable, loamy ſoil, with marly bottom, drained, on a cabbage preparation, ſowed oats with chicory and various other ſeeds—the oats were mown at harveſt, but had only been uſed as the means of laying down: in May, when the graſſes were mown and weighed green, thoſe with chicory were moſt productive. No rain fell till the 11th and 12th of July, when it was very heavy. On the 14th of this month, cut the chicory crop: the others had not any thing worth mowing. In Auguſt, cut all again, when the chicory crop had much the advantage in quantity. In the after-graſſes alſo the chicory was the only one productive." From the whole of the experiment it appears, that the ſuperiority of chicory, in general, over other plants in general is very conſiderable, which is a circumſtance principally to be attended to §.

As a very large proportion of green food is afforded by this plant at a period

* Annals of Agriculture, Vol. XX. † Ibid. Vol. XVII. ‡ Ibid. § Ibid.

when it is not otherwiſe eaſily obtained, its uſes in ſoiling cattle or other animals are evident.

In a comparative experiment of ſtall-feeding eight beaſts with tares and chicory, it appears that, on putting to tares only, from May 25 to June 21, they gained 49½ ſtones; weighed again 6th July, gained 17 ſtones:—on this weighing they were put to chicory, the tares and that both being given to them; weighed again 13th July, only one week afterwards, and had gained 27½ ſtones, or an advantage of about 8s. 7d. per head per week *.

Its utility for the purpoſe of paſturage is fully ſhown by other ſtatements.

On an experiment being made with ten pounds of this ſeed over five acres, in a good ſtrong wet loamy ſoil, ſown with barley among clover, treſoil, rib-graſs, burnet, &c., in order to remark in the paſturing whether ſheep and cattle would eat it as well as thoſe other graſſes; it was viewed during part of three years, particularly in the firſt autumn, after the barley was cut, when a fine fleece of herbage was produced: the two following years it was mown by the farmer, and fed through the latter. It proved by the reſult that the chicory was always eaten by ſheep, cows, and fatting bullocks, as cloſe to the ground as any of the other plants. Though horſes were in the field, no remark was made whether it was eaten by them; but in the ſtable ſoiling they ate it with avidity †.

Mr. Martin found it an excellent ſummer paſturage for ſtore ſheep, whether mixed with clover or alone, eſpecially on dry ſoils and in dry ſummers, as from its tap root it receives nouriſhment from a great depth, affords a large quantity of food, and bears eating cloſe without any danger of drought affecting it: it ſhould always be eaten cloſe. It may not be proper in feeding paſtures, as fat cattle muſt have abundance of food; for in ſuch caſes it would ſend up the ſeed-ſtalks too much, and they would not eat it, and by its luxuriant growth it might damage the finer graſſes ‡.

On a *braſhy* ſoil, the Duke of Bedford found that the produce of an acre ſown with this ſeed, the firſt year ſupported ſeven new Leiceſter ſheep, of about 22lbs. a quarter, for ſix months; and is of opinion that, on the ſame land, no other artificial graſs would have equalled it §.

There are ſome other plants occaſionally cut and uſed as a green food for cattle, ſuch as:

Buck Wheat (Polygonum Fagopyrum)----a plant, the utility of which has been

* Annals of Agriculture, Vol. XX. † Ibid. Vol. XV. ‡ Ibid. Vol. XXVIII. § Ibid. Vol. XXVIII.

much extolled by ſome cultivators, while others have thought leſs favourably of its advantages: with good farmers it is however a valuable crop.

It is capable of being grown on moſt ſorts of ſoil, provided they be ſufficiently dry and in a tolerably fertile ſtate; but anſwers beſt on thoſe of the thinner kinds, eſpecially where they are of a ſandy nature.

In the preparation of the land it is leſs difficult than many other plants, being ſometimes ſown with ſucceſs upon one earth. A fine clean ſtate of tilth is however the beſt, as graſs-ſeeds are moſtly ſown with it.

Seed and Time of Sowing.----The proportion of ſeed that is neceſſary in raiſing a crop of this ſort is about a buſhel to the acre; and it may be ſown at different times, in the ſpring and ſummer ſeaſon, as in May, and about the end of June or beginning of the following month. As it is a tender plant in its early growth, it ſhould never be ſown too early, ſo as to be in danger from froſts. It is generally ſown in the broadcaſt method, being well harrowed in.

After-management.—As crops of buck wheat uſually cover the ground well, there is ſeldom much attention neceſſary in their culture afterwards.

In the application of the crop, it is either ſuffered to remain for the purpoſe of ſeed, cut and uſed green for cattle, or ploughed under as a manure. In the firſt method, the produce is from four or five to ſeven or eight ſacks*, which is made uſe of in feeding horſes, fattening hogs, and keeping poultry. If ground, it affords a white flour. In ſoiling cattle, it may be mown twice in the ſummer ſeaſon. When given to milch cows, it is ſaid to increaſe the flow of milk in a conſiderable degree. In feeding it down green by hogs, it has been found to produce an inebriating effect upon them†. The quantity of food that it affords in this mode of conſumption does not ſeem to be well aſcertained. The method of ploughing it under for the purpoſe of manure has been already noticed in ſpeaking of manures: it is an excellent crop for ſowing graſs-ſeeds with.

When cultivated after tares, in Mr. Moſely's trials it was found to be highly advantageous as a preparation for wheat, preſerving the land, after their removal, from the effects of the ſun till the period of the wheat being put in. In Mr. Young's opinion, much is effected by this combination of crops: "a coat of manure is gained at no expenſe, the year carried through from Michaelmas to Michaelmas; and three crops put in, on three ploughings, viz. tares, buck-wheat, and wheat." It is not, he ſuppoſes, eaſy to form a more complete ſyſtem‡.

In particular ſituations and circumſtances, as where barley or other ſpring corn

* Suffolk Report. † Synopſis of Huſbandry. ‡ Suffolk Report.

cannot be put in ſufficiently early, the culture of this plant may be practiſed with great advantage. It ripens about October; in harveſting it, care muſt be taken that it does not ſhed.

It ſeems probable from ſome trials which have been lately made, that *winter barley*, as being extremely hardy and affording an abundant produce, may be grown with much more advantage as a green food for the purpoſe of ſoiling and the ſupport of ſtock, than buck-wheat.

As we have already pointed out the ſorts of land that ſeem moſt adapted to the purpoſes of tillage, it may here be neceſſary to ſay a few words on the proportion that ought to exiſt between the arable and graſs land on the ſame farm.

It is evident that this muſt be much influenced by local circumſtances and other cauſes, which have merely a relation to particular caſes; and that they muſt vary in a great degree, according to the nature of the ſoil, the methods of management that may be adopted, and the quantity of ſtock that is to be kept. On clayey ſoils a much larger proportion ſhould be kept in graſs than on moſt others, eſpecially when tenacious and not eaſily drained, as green winter food is ſcarcely to be obtained at all, or not without much trouble, difficulty, and expenſe: of courſe the working ſtock, and ſuch a number as are kept for conſuming ſtraw and making dung, muſt depend in a greater degree on meadow hay than upon ſoils which admit of the turnip and cabbage culture. Clover, indeed, ſucceeds on clays, but is uncertain and liable to failure: conſequently, without a certain reſource in the hay of natural graſs, much inconvenience muſt frequently be ſuſtained.

In the experience of the Rev. Mr. Young they have been found, when in the proportion of one half, to be conducted in a more profitable manner than in a ſmaller proportion, and not to allow of being managed with advantage in leſs than one third under the ſtate of ſward*.

In loamy ſoils, it is probable that a third or a fourth in graſs is the proportion that may be moſt ſuitable, and the more they tend to wetneſs the larger the proportion. Graſs is not, however, ſo neceſſary on theſe ſoils, as clover and other artificial graſſes of the ſame kind are leſs liable to miſcarry, and they admit the alternate huſbandry of graſs and grain in a more eaſy and profitable manner.

In the ſandy ſorts of land, there ſhould probably be as little as poſſible in the ſtate of graſs: they are, perhaps, beſt managed when nearly the whole is under the plough, as by means of proper cultivated graſſes, &c. the whole ſtock of the farm may be profitably ſupported, and the land reſted ſufficiently for enſuring a continued produc-

* Communications to the Board of Agriculture, Vol. III.

tion of grain. But in oppoſition to this rule, and moſt unprofitably, large tracts, in many diſtricts, are commonly withheld from the plough, under the name of barren heath land, &c. which by alternate tillage and reſt would produce more grain, and keep more ſheep than in the preſent ſtate*.

The different deſcriptions of calcareous ſoils may alſo be the moſt productive in a ſtate of arable cultivation, or with but a ſmall proportion of graſs. In ſome of the ſouth-weſtern diſtricts, from the farmers not being allowed by the land-owners to plough up down lands, too large a proportion remains in graſs for admitting the moſt advantageous cultivation. However, the degree of fertility which they have in many caſes attained, may in ſome meaſure juſtify the practice, on account of the ſupport afforded to ſheep ſtock in the winter†.

In peaty ſoils, from a great proportion of them ſeldom being in a ſtate, for want of proper draining, fit for tillage, the arable ſhould form a ſmaller proportion to the graſs than in other caſe: it can, however, only be fully regulated by local circumſtances.

But, beſides theſe, the modes of application in which the lands are managed muſt have conſiderable influence in regulating the proportions which the graſs ſhould bear to the arable, as where grazing, dairying, or the making of hay are the principal objects of the farmer, the whole of the farms are moſtly in graſs. In the two firſt of theſe caſes it is probable that the farms might be more profitably conducted by having a ſmall proportion in tillage, as from a fourth or fifth to a tenth, according to the nature of the lands, and the extent of cattle and horſes that may be kept; as by this means, not only ſtraw for litter may be more conveniently obtained, but likewiſe green vegetables for the partial ſupport of the ſtock, which muſt otherwiſe be often procured at great inconvenience and expenſe. In the caſe of hay farms, as they are moſtly in the vicinity of large towns, it may, perhaps, in moſt caſes, be better to purchaſe the ſtraw than provide it by tillage, as little will be neceſſary from ſmall teams only being required.

* Communications to the Board, Vol. III. † Ibid.

SECTION XII.

CULTIVATION OF GRASS LAND.

GRASS LANDS—Kinds of—Proper application of—Meadows and other Hay Lands—Difference of management in—Clearing from Stock—Times proper for in different cases—Removing obstructions to the Scythe—Coarse Weeds and Plants—Moss—Sticks—Stones—Cattle—Dung-hills—Ant-hills—Different methods of in each—Mole-hills—Catching and destroying Moles—MANURING—Proper times for—Kinds of Manure for—States in which applied with most benefit—Proportion of necessary—Repetition of—Some sorts used as top dressings cannot be often repeated—Chalk—Marle—Chopped woollen rags, &c.—Capable of being more frequently used in composts—Lime with vegetable substances often employed as top-dressings—Peat-ashes—Coal-ashes—Soot—Best applied after rain in March—Setting out manures—Attention necessary in—Mr. M'Donald's contrivance for—Spreading of—Bush-harrowing—Rolling—Modes of performing these operations—Proper times for—Methods of restoring grass-lands—WATERED MEADOWS—Nature of—Situations and soils proper for—Methods of forming—Spirit level useful in—Irrigation or Watering—Modes of conducting the process—Catch-work watering—Where capable of application—Circumstances to be attended to in—Utility often derived in watering from stirring mud in bottoms of mains, and the use of lime or other substances—Causes of the beneficial effects of watering—Vast utility of—Proper seasons for—Proportions of water necessary in different cases of—Lengths of time for continuing it—Mr. Wright's opinion of—Mr. Boswell's—Circumstances to be regarded in eating down watered lands—Useful in producing early grass—Mr. Temple's improvements by watering—Improvements by in Yorkshire—In Cheshire by Mr. Fenna—WARPING, a practice in Lincolnshire—Only slightly useful on grass-lands—MOWING—Proper periods for—Methods of performing—HAY-MAKING—Best methods of—STACKING and THATCHING Hay—Best methods of performing—Modes of preventing stacks heating—Stacking stages—Hay sweeps—AFTER-GRASS—Modes of management of—Mowing—Best application of produce of—Pasturing of—Utility of in this view.—PASTURE LANDS—Modes of management in—Removal of obstacles to Pasturage—Methods of improvement of—Different modes of application of—Modes of stocking and feeding down—Circumstances to be attended to in—DRINKING-PONDS—Utility of for cattle—Methods of forming of—Mr. Marshall's calculation of expenses of—Construction of by Mr. Billingsley—COW-KEEPING—Modes of monagement in—Cows proper for—Manner of foddering of—Times of milking of—Milk—Method of selling of—Profit of—SUCKLING CALVES—Methods of management in—Advantages of—REARING CALVES—Attention necessary in to have good live stock—Best methods of practice in different districts—WEANING CALVES—Attention necessary to wean early—Best methods of—Young stock should always be well fed—DAIRYING—Lands proper for different kinds of—Proper modes of conducting of—Convenient dairy-houses useful—Proper sorts of cows for—Must always be well foddered—Kinds of food proper for winter and summer—Times of milking of—Proper management of milk—Churning—Making butter—What necessary in these operations—Quantity of produce in—Cheese—Processes of making of—What necessary in the various operations of—Advantage of dairying in general—GRAZING—Lands most proper for—Methods of stocking of—Sorts of animals for in different cases of—Neat cattle—Sheep—Lambs—Systems of management in each—Horses—Hogs—Management in each—Advantages of—Produce of in different cases—SOILING AND STALL-FEEDING—Soiling—Vast advantage of in saving of food—What necessary to regard in—Methods of foddering employed in—Stall-feeding—Modes of management in—Kinds of food employed—Methods of feeding—Proportions of consumed—Advantages of different sorts of—HOUSE-LAMB SUCKLING—Convenient lamb-houses necessary for—Breeds of ewes proper in—Manner of feeding ewes in—Management in suckling-house—Advantages of—PLANTING—Cases in which useful—Soils adopted to—Kinds of trees proper for in different cases—FRUIT KIND—Apple—Pear—Sorts proper for cyder and perry—Soils suited to—Aspects most favourable for—Methods of planting—Proper

Diſtances for—Should not be planted too deep—Beſt ſeaſons for—Methods of pruning—Cauſes of blights, &c. in—Manner of keeping the fruit for cyder—Proceſs of making it—Produce in the apple and pear—Advantages of—TIMBER KIND—Soils proper for—Kinds of trees ſuitable for different caſes of—Oak—Aſh—Elm—Mountain-Aſh—Beech—Sycamore—Fir—Larch—Poplar—Willow—Ozier, &c.—Beſt ſizes of for planting—Manner of raiſing in the nurſery—Preparation of land for—Diſtances at which planted—Manner of planting in different ſituations—In belts, ſtripes, clumps, &c.—Method of mixing the plants—Warmth neceſſary in raiſing—Methods of planting out—Should be kept clean afterwards—Filling up vacancies—Planting hedge-row timber—Trees larger in theſe caſes—Proper pruning of—Methods of thinning in plantations—In underwoods—Oziers—Methods of planting and culture in—Profits of—Willow advantageous in ſome ſituations—Woods—Management neceſſary in—Cauſes of decay of—Modes of filling up—Times and methods of cutting over—In Buckinghamſhire—In Worceſterſhire—In Herefordſhire—In Staffordſhire—Time of cutting over in underwoods—Manner of performing the work.

LANDS in the ſtate of graſs muſt obviouſly be applied to different purpoſes, according to their nature, ſituation, and other circumſtances. Thoſe which are of the more moiſt and wet kinds, whether from the nature of the ſoil or the peculiarity of ſituation, and which have been a long time in the ſtate of ſward, are for the moſt part kept under the ſcythe; while thoſe of the contrary deſcription, that are ſituated at a greater height, and of courſe, in moſt caſes, poſſeſs a greater degree of firmneſs, are in general appropriated to the purpoſe of paſturage—though, in particular ſituations where graſs land is ſcarce, and conſequently of great value, they are likewiſe occaſionally converted to the purpoſe of hay. As graſs plants grow to the greateſt height in ſituations where a conſiderable degree of moiſture is conſtantly preſerved, and of courſe afford the largeſt produce, it would ſeem that the practice of keeping moiſt lands under the ſcythe is right on this account, as well as that of their being leſs firm and ſolid in their texture, and their moſtly producing a coarſer herbage. The more elevated grounds, as they bear the ſtock generally with leſs injury, and often afford both a more fine and ſweet feed, are with propriety converted to the uſe of being fed down by cattle and other animals. But by a ſuitable management in the feeding down, and uſe of manure, theſe ſorts of land may even be brought to afford a conſiderable produce in hay.

The common meadow lands, from their being ſituated in the hollows and ſloping ſides of the valleys, where the ſtaple and depth of ſoil of the lands have for a long time been continually increaſing by the depoſition of various ſorts of vegetable and other matters brought down from the higher grounds, are however, in general, in a conſiderably greater ſtate of fertility, and evidently better fitted for the permanent production of graſs than thoſe from which they have derived their richneſs. It has been well obſerved, that this ſort of land of all others is the moſt productive of graſs and hay, yielding ſuſtenances for cattle through the ſummer and winter, and producing an everlaſting ſource of manure for the improvement of the adjoining uplands; and

that in all caſes of extenſive incloſures, the improvement of the vale land, or that formed by nature for meadow and paſture, ſhould be firſt attended to*.

But as, from their greater retention of moiſture, in conſequence of their ſituation, and the depth of vegetable matter, they are liable to throw up coarſe herbage in many caſes, more drainage, as well as other management, is neceſſary to bring them into the proper condition for the growth of good herbage, than is requiſite in the hay grounds in the more elevated places. And by a more particular attention in theſe reſpects they would, in many inſtances, be rendered a vaſt deal more productive than they are at preſent, and at the ſame time afford a much better and leſs coarſe herbage. They would alſo admit ſtock upon them a much greater length of time, both in the autumn and ſpring ſeaſons.

The moſt proper ſeaſon for ſurface-draining graſs lands is in the autumn, when they are ſomewhat firm and dry, as in the early ſpring months ſuch lands are too full of moiſture. The grips, or ſmall open drains, ſhould be cut obliquely, in the moſt ſuitable directions for conveying off the ſuperficial ſtagnant water, the materials taken out being wholly removed. Much of this ſort of draining may be performed at a ſmall expenſe, and the beneficial effects be very conſiderable†.

Beſides, ſuch meadow lands demand much more attention in their management in other reſpects, as thoſe of their being fed by cattle, and the performing of the different operations that are proper for rendering them productive of good herbage. In theſe caſes ſtock ſhould be turned upon the lands, and manures applied with much care, and only when the land is in ſuch a ſtate of dryneſs as not to be injured by the poaching in or breaking of the ſward. The higher and more dry ſorts of graſs land, in moſt inſtances, admit of conſiderably more latitude in performing theſe different operations, as they are capable of admitting the ſtock, as well as the dung-cart, more early in the ſpring months, and of ſuffering them to remain to, or be applied at, later periods in the autumn, without inconvenience. The advantage of this attention is rendered ſufficiently plain by the effects which the contrary practice produces in ſuch meadow and other hay lands as are in a ſtate of commonage, where the ſtock is admitted at all ſeaſons and under all circumſtances.

As it muſt be evident to the moſt ſuperficial obſervation, that the breaking of the ſurface, texture, or ſward of graſs lands muſt in all caſes be prejudicial, not only by the deſtruction of plants, which is thereby immediately produced, but alſo by the retention and ſtagnation of water upon them in the holes and depreſſions from ſmall portions of the turf being forced in; the neceſſity and utility of clearing and removing all ſorts of live ſtock, and eſpecially thoſe of the heavy

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* Staffordſhire Report.

† Section on Draining of Land.

kinds, in both theſe deſcriptions of meadow lands, when intended for hay, becomes ſtrikingly obvious. In a piece of clayey meadow land expoſed to the treading of cattle during the wet ſeaſon of winter, with the view of fully aſcertaining the effects of the practice of ſuffering cattle to remain too long upon graſs hay lands, it was found that after three years, notwithſtanding every poſſible care and attention being employed in rolling, manuring, and ſowing graſs ſeeds, it was not reſtored to its former ſtate of ſward.

And it has been remarked that on the deep, tough, yellow, clayey graſs lands, in Middleſex, every care is taken to prevent the leaſt degree of poaching by cattle, as "it is well known that wherever a bullock makes a hole with his foot in this kind of ſoil, it holds water and totally deſtroys every veſtige of herbage, which is not quite replaced till ſeveral years after the hole is grown up*."

The exact period of performing this buſineſs cannot be eaſily regulated by any fixed rules, as it muſt always depend much on ſeaſon: but it ſhould never, on any account, be delayed after the grounds have become ſo much impregnated with moiſture as to eaſily give way to the tread of the animals. In the autumn ſeaſon the heavy cattle ſhould perhaps ſeldom be ſuffered to remain on the ſofter ſorts of lands longer than the beginning of November; but in thoſe of the more dry kinds they may be let remain to the end of that month with ſafety. Sheep ſtock may however in the drier kinds be continued till February, or later. And, in the ſpring ſeaſon, if paſtured at all, they ſhould not be admitted upon ſuch lands till they begin to poſſeſs a proper degree of firmneſs; which will depend on the various circumſtances of the preceding ſeaſon. On the more low and moiſt ſorts of meadow land it can, probably, ſeldom be ventured earlier than the middle of March.

But it is obviouſly a much better practice, eſpecially where hay is the main object, not to eat them down at all, or very little, with cattle in the ſpring, and not ſo much, as is the uſual cuſtom, with ſheep; as it is plain that by this means the cultivator will not only enſure a more abundant produce, but a much earlier one; and, of courſe, have more advantage in the making it into hay and ſecuring the crop.

And, where the lands are fertile and the graſs ſprings quickly, as is often the caſe near large towns, where manure is plentiful, it may be advantageous in the view of having a ſecond crop; as by that means the after-graſs may be cut more early, and be leſs in danger of being well ſecured. Beſides, in all events, the after-math will be in a more forward ſtate, and, of courſe, ready at a more early

* Middleſex Agricultural Report.

period for the admiſſion of ſtock of different kinds; which, in many caſes, is a circumſtance of great importance to the farmer.

The moſt proper periods of ſhutting up ſuch graſs lands as are deſigned for hay muſt, like thoſe of eating them down in the autumn by ſtock, depend on various circumſtances that can only ſuit the particular caſes. In general, however, it is the beſt practice not to delay it too long. When the lands are not eaten at all in the ſpring by cattle, after the ſheep have been removed, about the middle of February, nothing further is allowed to enter the meadows; by which means a quick vegetation is ſecured, as well as a more plentiful crop and a more early hay harveſt *. And in other caſes it ſhould probably ſeldom much exceed the beginning of April, as when eaten much later, eſpecially in the ſouthern diſtricts, there is not time for the graſs to produce a full crop before the commencement of the hay ſeaſon: of courſe, the farmer ſuſtains more loſs than can be repayed by any advantage in the additional feeding he may obtain. This is therefore the beſt practice where the view of the farmer is hay; and it ſhould be particularly adopted and attended to in cow farms, where it is of much importance to cut early, and at different times, in order to ſecure hay of a fine, ſoft, graſſy quality, for the purpoſe of producing large ſupplies of milk. In theſe caſes it is cut two, three, or more weeks before the uſual period, as it is found better not to let the ſeed-ſtems riſe.

After the meadows or other graſs lands have had the cattle and other ſorts of live ſtock removed from them in the early ſpring months, and been ſhut up for hay, they ſhould be prepared for the ſcythe, by having all ſorts of obſtructions picked up and removed. This work ſhould always be executed as ſoon as poſſible, before the graſs begins to ſpring up too much and conceal them, as it is difficult to perform the buſineſs effectually afterwards.

Extirpating coarſe Plants.—It is an excellent practice, but one that is too much neglected by graſs farmers in general, to have all ſorts of coarſe plants of the aquatic and other kinds, ſuch as ruſhes, fern, docks, thiſtles, and various others, effectually drawn up and eradicated both from the hedge-rows and other parts of the fields, in order to prevent their running up to ſeed and diſſeminating themſelves over the lands, and thus not only filling them progreſſively with all ſorts of trumpery, but greatly injuring the herbage. In a field on an extenſive hay farm in this neighbourhood, on perceiving the whole ſurface thickly ſtudded with thiſtles, it was found that this ſort of plants had been ſuffered to flower and perfect their ſeed

* Middleſex Agricultural Report.

annually, till the lands on every ſide had become fully ſtocked, to the vaſt injury of the crops. The ſame thing takes place with the dock and ſeveral other noxious plants; which ſtrongly enforces the utility of the practice juſt recommended. The annual expenſe of performing the buſineſs is but a mere trifle, while the advantage muſt be real and permanent. The ſaving to the farmer would be conſiderable by having the work regularly done as ſoon as the weeds fully ſhow themſelves, and, at the ſame time, his young hedge plants be prevented from being deſtroyed, by being ſhaded and choked up by ſo many weeds. In order to take them up in a perfect manner, a narrow implement of the ſpade kind, ſuch as is made uſe of in forming narrow drains, may be employed with advantage, as cutting or breaking them off is by no means effectual. After ſuch plants have been removed and the ground well cleaned, ſowing the banks and hedge rows with the beſt graſs-ſeeds, white clover, and othe rplants, might be an excellent practice; as, in this way, the lands may be improved rather than injured.

Plants of the ruſh kind may be eaſily removed by preventing the ſtagnation of moiſture near the ſurface, by judicious under or ſurface draining, and the application of ſubſtances of the ſaline or calcareous kinds, ſuch as aſhes, lime, drift from the roads, and other ſimilar materials. Theſe are beſt made uſe of in a dry ſeaſon, in either the autumn or ſpring; but the latter is probably the beſt, as theſe abſorbent materials will thereby be made uſe of at the time ſuch plants begin to ſhoot and eſtabliſh themſelves, and when there will be the leaſt danger of their operation being leſſened or prevented by too great a degree of moiſture. It has been obſerved, that in naturally coarſe meadows, or ſuch as become ſo in conſequence of ruſhes growing upon them before they have been rendered ſufficiently dry by draining, it forms a great improvement to apply a thin coat of ſand evenly over the ſurface of them, in the proportion of from twenty to thirty common loads *. By this means the ſward is rendered much finer, and a much better ſort of herbage brought up; white clover being predominant in moſt caſes.

There is another method that, in particular ſituations, may be more eaſy and convenient, and which has been found to quickly deſtroy plants of this coarſe kind by bringing up thoſe of a finer deſcription. This may appear extraordinary at firſt to thoſe who have not ſeen its ſudden and aſtoniſhing effects in this way. It is that of conducting water over the ſurface of ſuch grounds; but in this intention it ſhould not be ſuffered to have the leaſt degree of ſtagnation, but be conveyed off with as much expedition as poſſible by ſuitable drainage.

* Kent's Hints.

Moſs.—In particular caſes there is another ſort of plant that is apt to fix and eſtabliſh itſelf upon the ſurface, as in old graſs lands, both of the meadow and paſture kinds, that are of a clayey nature and ſituated in cold expoſed diſtricts, to the great injury and deſtruction of the natural graſſes. This is that of moſs, which is a vegetable that ſpreads and extends itſelf upon the ſurface, not only choking up, but depriving the graſs plants of the nouriſhment that is neceſſary for their ſupport and healthy growth. Various means have been propoſed by writers on huſbandry for the removal of this moſt deſtructive vegetable. But as it requires a conſiderable proportion of ſuperficial moiſture to promote its growth and extenſion on the ſoils which it infeſts, it is probable that the application of ſuch ſubſtances as have a tendency to abſorb and take up the ſuperabundant degree of wetneſs by which it is ſupported, muſt be of the greateſt utility and advantage.

In this view lime has alone been applied evenly over the ſurface, in ſuch caſes, with much benefit. We have, however, experienced ſuperior advantage by covering moſſy graſs lands with a thin even coat of attenuated calcareous matter, in union with a ſandy material, ſuch as is ſcraped up from roads, when formed into a compoſt with about one-fourth part of well-rotted farm-yard dung; as by this application the growth of the old graſs plants is not only rendered more ſtrong and healthy, but a new and more vigorous deſcription of graſſes brought up which ſoon overpower the moſs plants, and thus wholly deſtroy them. For the ſame purpoſe, and at the ſame time promoting the improvement of the lands, as well as bringing the herbage into a finer ſtate, the penning or folding of ſheep has been adviſed *. In this practice advantage is obtained in different ways, as by the effect which the treading has in opening and removing the cloſe netted texture of the moſs, and that of the urine and dung in promoting the more ſtrong growth of the graſs plants. This method may probably be had recourſe to with the moſt ſucceſs either in the cloſe of the ſummer ſeaſon or early in the ſpring months: the latter is, however, to be preferred; as, from the graſs immediately covering the ſurface, more effect may be produced in ſmothering and deſtroying the moſſy vegetation.

Harrowing with ſhort ſharp-tined light harrows is likewiſe a practice that may be found uſeful in ſome caſes, eſpecially previous to the application of ſuch ſubſtances or compoſts as have been juſt mentioned; as, by ſuch means, the matted nature of the moſs is broken down, and rendered more open and fit for admitting the manure to the roots of the graſs plants, and exerting its full influence in promoting their vigorous growth, and, at the ſame time, the ſpreading of the moſs in

* Kent's Hints.

ome meaſure prevented. After ſuch harrowings have been performed, ſome have recommended it as an advantageous practice to ſow graſs ſeeds, and eſpecially white clover, over the ſurface *.

Sticks.—As ſmall portions of rotten or other ſorts of ſticks are frequently diſperſed over the ſurface of graſs lands, from the hedges and trees, by the winds during the winter ſeaſon, they ſhould conſtantly be raked together or picked up, and conveyed from the land at the time the ground is ſhut up for hay; as, where this is neglected, they afford much obſtruction to the ſcythe, and render the work incapable of being performed in a complete manner.

Stones.—The removal of theſe is equally neceſſary with thoſe of ſticks, as they are not leſs injurious in impeding the progreſs of the mower: the practice of ſuffering ſuch ſorts of materials to remain blended with the manure, and ſet upon the lands with it, as is commonly the caſe in this as well as many other graſs diſtricts, is not leſs ſlovenly than reprehenſible. It would be much more eaſy, and far leſs expenſive, to ſeparate them during the time the manure is turning over and preparing for its application; and thus the trouble, expenſe, and occaſional neglect of having them afterwards picked off, would be avoided. When gathered up in the fields, they ſhould not, as is too commonly the cuſtom, be thrown together into heaps on the grounds, but be wholly removed, either into the gate-ways or other ſuitable places; as, when left in the heaps, they are not only liable to be again diſperſed on the lands, but injure them by their remaining and bringing up coarſe graſſes.

Cattle Dunghills.—Theſe are always neceſſary to be ſpread out as ſoon as the work can be conveniently performed after the ſtock has been removed; as the longer they are ſuffered to remain, the greater the injury the ſward ſuſtains by being made tender in the places they cover, and their preventing the natural graſſes from riſing, as well as bringing up coarſe plants, in ſome caſes, afterwards. In ſpreading the heaps, care ſhould be taken to break them well, and diſperſe them as evenly on the ſurface as poſſible; as, where this is not done, from becoming hard they are apt to impede the ſcythe.

Ant-Hills.—Where graſs-huſbandry is perfectly underſtood, and the lands kept under a proper ſtate of management, hills of this ſort are ſeldom or ever met with: it is only where the lands have been neglected, or conducted under an improper ſyſtem of cultivation, that they prevail either in meadow or paſture lands. From the greater degree of dryneſs in the latter ſort of land, they are more frequently found in them, eſpecially where the ſward is old and moſſy. Under circumſtances

* Kent's Hints

of the latter kind it may, in ſome caſes, be a more adviſable practice to break up the land altogether, than endeavour to remove the hills and deſtroy the inſects. But in many inſtances they may be removed without this trouble, and the land be reſtored to the ſtate of good ſward. Two methods have been chiefly depended upon in bringing theſe ſorts of land into proper order; which are thoſe of cutting the hills over in croſs directions, and hollowing out the internal mouldy part, and then laying the turfs down again, in an even manner, over the places where the hills ſtood, the earthy materials being afterwards chopped ſmall and ſpread evenly over the land; and of paring them wholly off even with the ſurface of the ground, and depoſiting them in heaps, in proper places, that they may rot and decay, ſo as to become in a ſtate of fine mould, and be mixed up with lime in the proportion of a third or fourth, according to the circumſtances of the land, and then ſpread out thinly over the ſame ground. Both theſe modes may, probably, be practiſed with advantage under different circumſtances; as, where the fields are in ſight from houſes, or otherwiſe much expoſed to view, the former may be the more adviſable, as rendering the ground leſs diſagreeable to the eye; but under other circumſtances the latter will be the moſt proper, not only as more effectually extirpating the ants, but as affording a more laſting improvement to the land *. In either method, heavy and frequent rolling ſhould conſtantly be had recourſe to afterwards, as it is in a great meaſure from the want of this that the hills are at firſt produced. It is, indeed, rendered extremely probable by the fact ſtated below, that this practice may alone, in many caſes, effectually remove this ſort of hill. In the rolling down of ant-hills inſtead of cutting them up, in an experiment made by the Duke of Graſton, it was found to be attended with complete ſucceſs. A large paſture which had been very much infeſted with ants, and which they had almoſt covered with hills, was perfectly reſtored by repeated heavy rollings †.

In theſe caſes the rollings ſhould be performed both in the autumn and ſpring ſeaſons, when the lands are in ſuch ſtates of moiſture as juſt to admit the impreſſion of the roller without receiving injury from the feet of the animals. If ſuch operations be executed when the grounds are in a ſtate of conſiderable dryneſs, the benefits will be comparatively but ſmall. The good effects that are produced in this proceſs depend upon the degrees of conſolidation effected; as it is only by this means that the inſects can be prevented from carrying on their various operations; a certain ſtate of lightneſs as well as fineneſs in the mould being eſſential to the complete execution of their labours.

* Kent's Hints. † Annals of Agriculture, Vol. XVI.

Other modes of deſtroying theſe inſects, and preventing the formation of their hills, have been made uſe of. As the economy of the ant requires the ſituation and ſoil to be dry and friable, in order to carry on their works, it is probable that, in lands that will admit of the practice, it may be an eaſy and convenient method of deſtroying them, and preventing the bad conſequences which their labours produce on the ſurface ſward, to conduct water over them; and thus, at the ſame time, exterminate the colonies of ants and irrigate the ground; by which two improvements may be effected at once,—the land being cleared from ant-hills, while its fertility is conſiderably increaſed.

The uſe of night ſoil, in compoſition with various ſorts of earthy materials, has been recommended with the intention of deſtroying ſuch inſects; but we ſuſpect that it can only be effectual in caſes where they have not attained any great height.

Mole-Hills.—In the more rich and fertile ſoils, hills of this ſort are frequently thrown up in great numbers, from their abounding more with the food of the ſubterraneous animals that produce them. Meadows are often extenſively and ſeriouſly injured in this way. On account of their depth of ſoft humid ſoil, moles uſually reſide, deſtroy, and render uſeleſs the graſs, not only of the very ſpots where the hills are raiſed, but likewiſe to ſome extent immediately round them, as well as by impeding the free courſe of the ſcythe: for theſe reaſons the extermination of moles becomes an object of great conſequence to graſs-huſbandry.

In the early ſpring months, when ſuch hills are in a tolerably dry and powdery ſtate, no time ſhould be loſt in ſpreading them out, and diſperſing them in as even and regular a manner as poſſible over the ſurface of the ſward that adjoins them; as, when they remain long without being ſcaled, they do conſiderable injury to the graſs plants underneath them, by blanching and rendering them tender. This buſineſs may be very conveniently performed by a common iron-toothed garden rake.

But it is invariably the beſt method never to ſuffer the animals to remain in the land, but to procure an expert mole-catcher to deſtroy them, and thus wholly prevent the hills from being thrown up.

The mole is a ſubterraneous inhabitant, whoſe health will not bear the free acceſs of the air for any great length of time, ſeldom coming upon the ſurface except for the purpoſe of changing its habitation: its food is worms, ſubterraneous inſects, or the roots of plants, and it is ſuppoſed never to drink: it is, as has been juſt noticed, moſt prevalent in fertile ſoft ſoils, avoiding clayey or gravelly grounds; and on the introduction of water into its receſſes, it immediately makes its eſcape to the ſurface;

yet it has been obſerved to ſwim acroſs water *. During wet ſeaſons it betakes itſelf to the upper and leſs humid lands, returning in the ſpring to the ſoft mould of the meadows, where it can eaſily perforate and find plenty of food. The breeding ſeaſon of this animal are the months of February, March, April, and May, producing generally four or five at a birth. The conſtant employment of the mole is to make ſubterraneous tunnels, which are uſually parallel to the ſurface, at the depth of from four to ſix inches; but when intimidated, it will penetrate a foot deep for ſecurity. In the formation of theſe paſſages the mole-hills are raiſed; a mole on changing its abode generally throwing up from four to nine of theſe hills, the paſſages communicating with each of them. Theſe few circumſtances, concerning the natural hiſtory of the mole, may in ſome degree ſerve to direct the operator in the beſt and moſt ready means of catching, or otherwiſe deſtroying, ſuch animals.

In order to deſtroy theſe animals, it has been recommended to inject the ſmoke of burning ſulphur and tobacco into their ſubterraneous retreats. However, as the earth frequently falls in behind them as they paſs, or becomes accumulated as they perforate the ground, this method of deſtroying them can ſeldom be effectual, unleſs the neſt of the animal be near the aperture through which it has been fumigated. Water has alſo been adviſed to be poured into their holes, which is ſeldom more efficacious, though it may have had effect in particular caſes. Baited traps have likewiſe been tried, but with little better ſucceſs.

On the authority of an experienced mole-catcher in Nottinghamſhire, the following method of deſtroying theſe animals is deſcribed by Dr. Darwin:—"Moles have cities under ground, which conſiſt of houſes or neſts, where they breed and nurſe their young: communicating with theſe are wider and more frequented ſtreets, made by the perpetual journeys of the male and female parents, as well as many other leſs frequented alleys, or by-roads, with many diverging branches, which they daily extend to collect food for themſelves or their progeny." They are more active in the vernal months during the pairing ſeaſon; more numerous burrows are therefore at this time made in the earth for the purpoſe of meeting with each other; and though they are moſtly conſidered as blind, they appear to have ſome perception of light even in their ſubterraneous habitations, as they begin their work as ſoon as it is light, and of courſe before the warmth of the ſun can be ſuppoſed to affect them. On theſe principles, this mole-catcher's method conſiſted firſt in attending their ſituations early, before ſun-riſe, as at that time he could frequently ſee the earth move over them, or the graſs upon it; and with a ſmall ſpade cut off their retreat by

* Darwin's Phytologia.

ſtriking it into the ground behind them, and then digging them out. By laying the ear to newly raiſed mole-hills, the noiſe of the ſcratching was ſometimes heard at a diſtance, ſo as to direct where to find them; from the ſolid earth conveying ſlight vibrations of ſound better and to a greater diſtance than the light air. A terrier dog, after being accuſtomed to this buſineſs, was alſo often found of ſervice, in detecting, by his noſe, the abode of the mole beneath the ſoil, ſhowing it by beginning to ſcratch the earth above it.

As it has been obſerved that a mole moſtly "ſuckles four, five, and ſometimes ſix young ones, placed conſiderably deeper in the ground than their common runs; and as theſe neſts are ſunk much deeper into the ground than their ſtreets or by-roads, and the mole-hills conſequently larger; the earth on the ſummit of thoſe hills is generally of a different colour, and is raiſed higher than that of the others. Theſe neſts are to be dug up, having firſt intercepted the paſſage between them and the mole-hills in their vicinity to cut off the retreat of the inhabitants. The next important circumſtance is to diſcover which are the frequented ſtreets and which the by-roads, for the purpoſe of ſetting ſubterraneous traps: this is effected by making a mark on every new mole-hill by a light preſſure of the foot, and on the morning by obſerving whether a mole has again paſſed that way and obliterated the foot-mark; and this is to be done two or three ſucceſſive mornings. Theſe foot-marks ſhould not be deeply impreſſed, leſt it ſhould alarm the animal on his return, and he ſhould form a new branch of road, rather than open the obſtructed one: the traps are then to be ſet in the frequented ſtreets, ſo as nicely to fit the divided canal. They conſiſt of a hollow ſemicylinder of wood with grooved rings at each end of it, in which are placed two nooſes of horſe-hair, one at each end, faſtened looſely by a peg in the centre, and ſtretched above ground by a bent ſtick: when the mole has paſſed half way through one of the nooſes and removed the central peg in his progreſſion, the bent ſtick riſes by its elaſticity and ſtrangulates the animal. As it was found that where the ſoil was too moiſt or tenacious, the moles in paſſing the old runs ſometimes puſhed a little of it before them, and thus looſened the central peg before they were in the nooſe, the peg in ſuch caſes was fixed a little faſter in the middle of the trap." This method was purſued with great ſucceſs.

Manuring Graſs-Lands.—In order to preſerve meadow and hay lands in the moſt ſuitable condition for the production of plentiful crops of graſs, as well as to alter and improve the nature of the herbage, the occaſional application of manure becomes neceſſary; as by this means the ſtaple and depth of vegetable mould are not only much increaſed, but the land brought into ſuch a ſtate of fertility as that it

may afterwards be kept up with much leſs expenſe and trouble. It is a circumſtance well known to graſs farmers in the beſt cultivated diſtricts, that when lands of this ſort are ſuffered to get much out of condition, it is a much more difficult buſineſs to reſtore them to the proper ſtate of productiveneſs, than to preſerve them in it. From the conſtant decompoſition and decay of various vegetable materials on the ſurface of graſs lands, new portions of vegetable mould are conſtantly added, that improve the quality of the lands, and at the ſame time afford a more ſuitable and fertile bed for the eſtabliſhment of the different kinds of graſs plants. It is chiefly, perhaps, on theſe accounts that old graſs lands are ſuperior to new ones, and it explains the reaſon of the greater utility of earthy compoſts with dung in the latter than the former caſe.

There has been much difference of opinion in reſpect to the moſt proper periods of making ſuch applications; but it is obvious that it ſhould be regulated by circumſtances of different kinds; ſuch as the ſtate of the land in regard to dryneſs, the peculiarity of its ſituation, the heat of the ſeaſon, and the nature and condition of it in reſpect to ſoil and fertility. Where the nature of the lands is ſuch as not to admit the dung-cart in the early ſpring months without the danger of injuring the ſurface by poaching or breaking the texture of the ſward, the moſt proper ſeaſon would ſeem to be in the beginning of the autumn, before the heavy rains fall, as at this period the manure may be laid on with the greateſt convenience and ſafety; and from the after-graſs being chiefly fed down with the leaſt loſs in that reſpect. Some, however, recommend this operation to be performed immediately after the land has been mown and cleared from the hay; and in this method there may be an advantage in ſome caſes, as the growth of the after-graſs may thereby be rendered more full and abundant. But on other accounts it muſt often be not only inconvenient, but uneconomical, as, from its happening at a ſeaſon when much other buſineſs is to be performed, it can ſeldom be attended to in ſuch a manner as is neceſſary; and when the ſeaſon at this period is hot, and there is much ſun, as in general is the caſe, there muſt be conſiderable loſs ſuſtained in the extrication and diſſipation of the finer and more enriching particles, ſuch as become more immediately the food of plants from their being in a condition nearly ſuitable for being abſorbed and taken up by the roots of the graſſes. The extent of the loſs incurred in this way is much more conſiderable than is commonly ſuppoſed, as muſt appear evident from the great exhalation and conſtant evaporation that is often kept up for many days, or even weeks, as the very offenſive ſmell that iſſues fully proves. In this diſtrict, where we have occaſionally witneſſed the practice, with ſome of the leſs intelligent farmers, the moiſture of the manure has been ſo much forced off and

diſſipated, eſpecially when there is much wind, as to leave the materials in nearly a perfectly dry ſtate. The ſudden drying up of large ponds, at ſuch ſeaſons ſhows in a more ſtriking manner the extent of the injury that the farmer ſuſtains in chooſing this ſeaſon for the application of his manure.

Beſides, there is another way in which a vaſt loſs of manure may take place when applied at either of the periods that have been juſt noticed, eſpecially where the lands lie in ſloping directions, as is frequently the caſe, which is by the heavy rains in the autumnal ſeaſon carrying down the more fine and rich parts of the manure, in a ſtate of ſolution, into the ditches and runlets on the ſides or other parts of the fields. Of the great waſte of manure occaſioned in this way any one may convince himſelf, by attending to the ſtate of the water as it drains off from the higher grounds into theſe places, after the land has been previouſly dreſſed, as it will be found highly coloured, and loaded with the enriching carbonaceous particles of the manure. After froſts when ſudden thaws occur, the ſame thing happens*.

In ſituations that will, from the natural dryneſs and compoſition of the ſoils, admit of the practice of applying the manure in the early ſpring months, there will be leſs riſk of waſte in theſe ways, and at the ſame time more advantage obtained in the growth of the produce; as from the moderate heat and quickneſs of the vegetation at this ſeaſon the graſs will ſoon cover over and conceal the dung, when applied in a proper ſtate of reduction, without ſuffering much exhalation to take place; and the enriching material be conveyed to the roots of the graſs plants at the ſeaſon in which it can be the moſt uſeful in promoting their growth. Where quantity of produce is the principal object, and the nature of the ſoil will admit of the manure's being applied without injury, this is therefore unqueſtionably the moſt proper as well as moſt beneficial time of putting the dung upon graſs lands. The earlier, however, it can be performed in the ſeaſon the better, as has been already more fully explained †.

An agricultor of much experience and obſervation has, however, found manure to produce the ſtrongeſt effects upon the land when applied early in the autumn, or in meadows as ſoon as poſſible after they have had the hay taken off from them ‡. Others, likewiſe, ſuppoſe this laſt as the moſt proper ſeaſon for the buſineſs §.

There is ſcarcely any ſort of manure that will not be uſeful when laid upon the ſurface of graſs lands, but in general thoſe of the more rich dung kinds will be the moſt ſuitable for the older ſorts of ſward land; and dung in compoſition with freſh vegetable earthy ſubſtances the more uſeful in the new lays or graſs lands, as by this

* Section on Manure. † Ibid.

‡ Dr. Wilkinſon in Communications to the Board of Agriculture, Vol. III. § Rev. Mr. Younk in Ibid.

means a fine vegetable ſoil will be prepared for the roots of the graſs plants to ſhoot and ſpread themſelves into, and conſequently a better ſward formed. But the moſt ſuitable ſorts of applications in theſe caſes have been deſcribed in conſidering the moſt proper management of ſuch lands as have been newly laid down to graſs.

In this diſtrict, where graſs huſbandry begins to be tolerably well underſtood, it is the practice of the beſt farmers to prefer the richeſt dung they can procure, and ſeldom to mix it with any ſort of earthy material, as they find it to anſwer the beſt in reſpect to the quantity of produce, which is the principal object in view; the cultivators depending chiefly on the ſale of their hay in the London markets. The lands on which this practice is purſued are moſtly ſuch as have been under the ſtate of ſward a conſiderable length of time, and the ſoils chiefly of the more tenacious loamy or clayey kinds. There cannot, however, be any doubt, but that earthy compoſts in the proportion of a third or fourth may in many caſes, according to the nature and circumſtances of the land, be applied with great and very beneficial effects, both in rendering the land more fertile and productive, and in bringing the herbage into a better ſtate, as well as for improving the ſurface for the ſcythe. The ſorts of ſubſtances that may be the moſt beneficially employed in this way have been fully deſcribed in ſpeaking of manures.

But, whatever the material may be that is employed in compoſt with dung, or the nature of the manure, they ſhould invariably be brought into a conſiderable degree of reduction. It is the practice in this diſtrict to turn over the dung that is brought from London in a tolerable ſtate of rottenneſs, once chopping it well down in the operation ſo as to be in a middling ſtate of fineneſs when put upon the land. It is neceſſary, however, that it ſhould be in a more rotten and reduced ſtate when applied in the ſpring than when the autumn is choſen for the purpoſe*.

The proportion of manure that is neceſſary muſt in a great meaſure depend upon the circumſtances of the land, and the facility of procuring it. It ſhould in general be ſuch as to afford a good covering to the whole ſurface of the ground. In this diſtrict, where the manure is of a very good and enriching quality from its being produced in ſtables and other places where animals are highly fed, the quantity is uſually from four or five to ſix or ſeven loads on the acre, ſuch as are drawn by three or four horſes in their return from town on taking up the hay. But where the manure is of inferior quality, there may be a neceſſity for a much larger proportion †.

In regard to the frequency of dreſſing graſs lands, it muſt obviouſly depend upon a variety of other circumſtances, as well as that of the convenience of the farmer,

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* Section on Manure. † Ibid.

and the means he has of providing it. But ſo far as it reſpects the ſoil, it ſhould, on the principles laid down above, conſtantly be performed at ſuch diſtances of time, as that the fertility and condition of the land may not be ſuffered to decline, but be kept up and preſerved in an equal or increaſed ſtate of heart. In this intention the manner and frequency of cutting, or otherwiſe conſuming the produce, muſt be attended to; as, where crops are more frequently taken off, the land muſt be prevented from being injured, by the great loſs of fertility that muſt ariſe in this way, by the dreſſings being applied at ſhorter intervals, or in larger proportions at a time.

On meadow or graſs lands that are in a proper ſtate of cultivation, its being applied every third year may be ſufficient; but on ſuch as are of inferior value, every ſecond year may be a better practice, as the lands by this frequent application of manure may attain a gradual improvement; whereas, in the other caſe, they would be on the decline, and in time become poor and exhauſted.

It is a too common practice, in diſtricts where graſs, huſbandry is imperfectly underſtood, to almoſt wholly neglect the manuring of their ſward lands, in order to employ it on thoſe that are under the plough: but this is evidently a bad and diſadvantageous method for the cultivator; as it is only by the raiſing of abundant crops of graſs for the purpoſe of being converted into hay, and of ſuitable kinds of green crops for green food, that an abundant ſtock of cattle can be kept, and the largeſt proportions of manure ſupplied.

There are ſome ſubſtances employed in the way of manure, as top-dreſſings to graſs lands, that cannot be frequently repeated with either ſafety or advantage. Chalk, marl, chopped woollen rags, and ſome other ſimilar materials, are of this kind. The firſt of theſe kinds, eſpecially when of a ſoft unctuous nature, ſo as to readily fall down in the ſtate of ſolution to the roots of the graſs plants, is found to produce the moſt beneficial effects, in rendering the lands more fertile and productive, and improving the quality of the herbage. It cannot, however, be often repeated in its ſimple ſtate with advantage, as it is ſome time in producing its full effects; but in that of compoſt, it may be applied with ſucceſs at ſhorter intervals. Marl is likewiſe a ſubſtance, eſpecially when it is of the rich ſoapy kind, that may be made uſe of with much advantage as a top-dreſſing on graſs lands; but as its operation is ſlow, it cannot be repeated at ſhort intervals, except when employed in the ſtate of a compoſt with dung. Woollen rags, when rendered ſmall by being chopped into pieces, may be laid on land in the ſtate of ſward; but as they require a conſiderable length of time to ſink down and become mixed with the ſoil, ſo as to be well covered by the graſs, they cannot be repeated at ſhort intervals. After

they have been fully incorporated with the land, their beneficial effects are conſiderable, as have been ſhown by the trials of different cultivators.

There are ſeveral other materials that are occaſionally uſed as top-dreſſings on graſs lands; ſuch as lime in combination with rich vegetable earth and with peat, the aſhes derived from the combuſtion of peaty ſubſtances, coal aſhes, and ſoot. All theſe have been made uſe of with good effects when thinly ſpread out over the ſurface ſwards of lands in the ſtate of graſs, as has been already ſufficiently ſhown *. The three laſt have been found to produce the beſt effects in being diſperſed over the new lays of the artificial graſs kinds. All applications of this ſort ſhould be applied about the beginning of March, being ſpread over the ſurface as evenly as poſſible. If it can be done before a ſhower of rain it will be the better, as it is of advantage to have them carried down to the roots of the graſſes as ſoon as poſſible after they are laid upon the land.

In the putting of manure upon lands of this ſort, ſome attention is neceſſary not to ſuffer too much to be placed out in any of the heaps, but to have them ſet out as much as poſſible in not too large equal proportions, and at regular diſtances from heap to heap; as, where the contrary is the caſe, it not only takes up more time, and cauſes much more trouble to the labourer in ſpreading them, but does not admit of the work being performed in ſo regular or ſo exact a manner. Beſides, when the heaps are ſet out too large, more injury is done to the graſs plants on the ſurface where they ſtood, if not ſoon ſpread out; which ſhould always be the caſe. The carts employed in many diſtricts for ſetting out dung in heaps are by no means convenient for the purpoſe. In this neighbourhood this ſort of buſineſs is far from being well executed, except where ſmall carts are in uſe. From the large ones commonly made uſe of, the heaps are apt to be ſet out not only very unequal in ſize, but much too large, and there is conſiderable trouble in conducting the work. In many other diſtricts, carts for the purpoſe are in general uſe, and conſtructed ſo as to render the labour more eaſy and convenient.

A very ingenious contrivance to facilitate the unloading of carts filled with dung, or other ſorts of manure, is mentioned by the author of the Perthſhire Agricultural Report, as in uſe by Mr. M'Donald. This improvement conſiſts in the box of the cart being ſuſpended at different heights; but can only be employed with advantage in carts conſtructed on a moveable frame, or what are uſually called *coup-carts*, and where the load is to be diſcharged in ſeveral portions or heaps. A thin piece of iron

* Section on Manures and After-management of New Lays.

of about two inches in breadth being fixed on the fore part of the box of the cart, exactly in the middle, extending in length to the top of the box, in which are inſerted three or four oblong holes, in ſize correſponding to a rod, which is fixed with a ſtaple in the middle of the firſt bar that keeps the ſhafts together: the length of this rod is about 18 inches, or longer if neceſſary, as the height or length of that part of the box reſting on the frame may require. The top of the rod is formed into the ſhape of a creſcent an inch wide, with the points upwards, which correſponds with the holes in the plate. When the rod is not in uſe, it is made to reſt on a hook in the front of the box, to prevent its dangling. When the driver wiſhes to unload his cart, he raiſes the box, putting the rod into the firſt nick, and makes the firſt heap, and moves on to the place where he intends to put down the ſecond, again raiſing the box to the ſecond nick, and ſo on till the whole is diſcharged.

In the ſpreading out of all ſorts of materials on the ſurface of graſs lands, it is neceſſary to ſee that the buſineſs be performed in an exact and even manner, and that all the clods and lumps be well broken down and perfectly reduced by beating with the fork or ſhovel. If poſſible, a dry ſeaſon ſhould be choſen for this ſort of work, as, under ſuch circumſtances, it can be executed in the moſt regular and exact method. When the weather is wet it is an operation that can never be well performed, as the materials clog round the feet and tools of the workman, and can never be effectually ſeparated or divided ſo as to ſpread out with the neceſſary degree of evenneſs. After the heaps have been ſet out, they ſhould not be ſuffered to remain ſo long, as is often the caſe, before they are ſpread out, as the plants underneath them become blanched and tender, and great injury is done to the ſward in ſuch caſes, all of which may be eaſily avoided by ſpreading as ſoon as poſſible after the manure is taken out. Inconveniences of this ſort may likewiſe be avoided by ſpreading the manure from the carts, as is the practice in the midland and ſome other diſtricts; but in this method we ſuſpect the work can neither be executed in ſo exact a manner, or with ſo much economy of time to the labourer. In this way hill-ſteads will not however be formed, and, of courſe, the diſadvantage of their getting too large a proportion of the manure prevented *.

Buſh-harrowing.—When the whole has been ſpread out, and remained in that ſtate for a fortnight or three weeks, or longer, according to circumſtances, and the whole is become in ſome degree dry and pulverizable, a buſh-harrow ſhould

* Marſhall's Midland Counties, Vol. II.

be paſſed over the ſurface once or twice in a place, as may be neceſſary, in order to reduce the manure into a finer ſtate, and apply it more fully to the roots of the graſſes. This operation, like that of ſpreading, ſhould never be attempted when the ſeaſon is wet and the manure in a cloggy adheſive ſtate. When this work has been finiſhed, all the rubbiſh of every kind ſhould be carefully picked off, in order that the ground may receive the impreſſion of the roller.

Rolling Graſs-Land.—This is a proceſs that is of conſiderable utility in the management of graſs lands, eſpecially ſuch as are under the ſcythe, as without it they are often liable to become hilly and uneven, as well as the graſs in ſome caſes to become tuſſocky, or riſe in large tufts. The impreſſion of the roller not only renders the ſurface more fine and level, but at the ſame time induces the graſs plants to ſpread more laterally, and in that way to form a better and more cloſe ſward. Its importance on new laid down graſs lands is therefore extremely obvious; as it muſt be highly ſerviceable in theſe different intentions. The worm-caſts are by this means reduced and brought into order, by which means the mowing can be performed with greater facility and in a cloſer manner. Beſides, it may be uſeful in other views, as by preſſing the mould, as well as the manure, more cloſely round the roots of the graſs plants; and in conſequence of ſuch means they may not only be better eſtabliſhed in the ſoil, and their vigorous growth more effectually promoted, but, from the moiſture being more fully preſerved in the ground, be in leſs danger of injury from the effects of heat in the ſummer months, and of courſe better crops be afforded.

On graſs land the work of rolling may be advantageouſly performed at different ſeaſons, as in the beginning of the autumn and in the commencement of the year, or the very early ſpring months; but the latter is the moſt common period. But in order to its being executed with the greateſt poſſible benefit, a time ſhould always be choſen, if poſſible, when the ground is in a ſuitable ſtate for receiving the impreſſion of the implement. In the drier deſcriptions of land it may frequently be performed in the moſt beneficial manner after the land has been rendered a little ſoft by a moderate fall of rain; but in thoſe of the contrary ſort it may be neceſſary to wait till the ſuperabundant moiſture be ſo much dried up as to admit the animals employed in drawing the machine without poaching, or otherwiſe injuring the ſurface of the ground.

A roller of conſiderable weight is neceſſary in performing this buſineſs in the moſt complete and effectual manner, ſuch as has been already deſcribed *. And in

* Section on Implements.

order to prevent as much as poſſible the ground from being injured by the feet of the animals that draw it, as may frequently be the caſe where they follow each other in the ſame track: it may be the beſt practice to have them yoked double, as by that means there will be leſs treading on the ſame portion of ſurface. Where two horſes are ſufficient to execute the work, more ſhould never be made uſe of; but if a third ſhould be found neceſſary, it may be attached as a leader in the middle before the other two: a greater number of horſes can ſeldom or ever be of any material advantage in this ſort of work. It is neceſſary to be very careful in executing this operation, to ſee that every part receives the due impreſſion of the implement. On lands where this ſort of work is regularly performed, it will ſeldom be requiſite to paſs more than once in a place, but in other caſes it may often be done more frequently with benefit.

The rolling of watered meadows ſhould be executed towards the latter end of February or beginning of the following month, after the land has been left in a dry ſtate for a week or ten days. The work ſhould be performed lengthways of the panes, going up one ſide of the trenches and down the other*. And in rolling the common hay lands, it is a good method to proceed up one ſide the field and down the other ſomewhat in the ſame manner.

As graſs lands, eſpecially thoſe that have not been long reſtored to the ſtate of ſward, are ſometimes liable to become thin and patchy, it may be neceſſary to reſtore or bring them to a perfect condition of ſurface, by ſowing freſh graſs ſeeds over the patches or uncovered parts. This is beſt performed as early as poſſible in the ſpring ſeaſon, during moiſt weather, the ſeeds being either left to themſelves, or trodden in by folding ſheep thinly upon them. The roller may likewiſe be uſeful in this view by being run over the patches, though not ſo effectual as that of ſheep. In this, as well as other caſes, ſuch ſorts of graſs ſeeds ſhould be choſen as are the moſt adapted to the nature of the lands. Scarifying, or cutting the ſurface of graſs lands by harrows or other implements ſet with coulters, has been lately practiſed, but not yet ſo fully as to aſcertain its utility. It proceeds on principles contrary to thoſe of rolling in the autumnal ſeaſon.

Watered Meadows.—There are frequently extenſive tracts of graſs land, that from the nature of their ſituations are capable of being covered occaſionally with water, from the rivers, brooks, or ſmall ſtreams, that flow through or near to them, and in this way admit of being improved and kept in a conſtant ſtate of fertility and productiveneſs, without the trouble or expenſe of other ſorts of manure.

* Boſwel on Water Meadows,

The greateſt improvements in this way are effected, and the expenſes of performing them the leaſt, in thoſe places where the current or deſcent of the ſtreams is the moſt rapid*.

* The Implements made uſe of in conducting this ſort of buſineſs are, according to Mr. Boſwell, the following:

Water Levels.—Many of which are in uſe and are well known. The *Spirit level* is probably the beſt for this purpoſe. But in this work the labourers often diſpenſe with the uſe of ſuch inſtruments, bringing the water after them to work by. In forming a *main*, he ſays, they begin at the head, and work deep enough for the water to follow them; and in drawing a *tail drain*, they begin at the lower end of it, and work upwards, to let the tail water come to them, as this method gives the moſt exact level.

Line, Rules, and Breaſt Plough.—Theſe are well-known implements; the laſt being moſtly uſed in cutting turf for the ſides of the cuts.

Spades.—In thoſe uſed in this work the ſtems are conſiderably more crooked than in any other ſpades; ſo that the workman in the bottom of the ditch is able to make his drain or trench ſmooth and even, when ſtanding in a working poſition. The bits are made of iron, about a foot wide in the middle, terminating in a point, having a thick ridge down the middle, and thin and ſharp on the edges: when become thin and narrow by wearing, they are uſed for the ſmaller trenches.

Creſcent.—This is an implement ſimilar to a gardener's edging knife, but larger, very thin, and well ſteeled, having a ſtem about three feet long, with a croſs handle to bear upon. Its uſe is to trace out the ſides of the mains, trenches, drains, &c.

Wheel-Barrows.—For this uſe theſe are made *open*, without ſides or hind part; they ſerve for conveying ſods, &c.; for embanking, damming, &c.

Hand-Barrows.—Theſe are likewiſe in uſe for the ſame purpoſe where the ground is ſoft and flooded.

Three-wheeled Carts.—Theſe are made uſe of for different purpoſes, and have broad rimmed wheels. As the wheels do not follow each other in the ſame track, and as the weight is borne more equally, they are leſs ſubject to cut and ſink into the ſoil.

Scythes.—Short and narrow ones are in uſe during the running of the water, to cut away the weeds and ſuperfluous graſs.

Forks and Crooks.—Theſe are wanted when it is neceſſary to clear the drains of weeds and roots. The crooks are formed with long tines for this purpoſe, ſimilar to dung-drags, and ſhould be made light, and with long ſtems, ſo that the workmen may reach into deep water with them to clear obſtructions.

Stout Boots.—Theſe ſhould have tops to draw half way up the thighs or more. They ſhould be formed of ſtout leather, well greaſed with tallow, ſo as to reſiſt running water for ten or twelve hours, and ſhould be large enough to admit of ſtuffing them down with hay all round the legs.

The Terms employed in the art are thus explained by irrigators:

Sluice.—This differs from a wear ſimply in reſpect to its having but one thorough; for if there be more thoroughs it then becomes a *wear*. It applies in a ſmall ſtream in the ſame way as a wear does in a large one.

Trunk.—This is a covered ſluice, and is ſo conſtructed in all caſes where two ſtreams of water are to croſs each other at the point of diſcharge, or if it is to ſerve as a bridge.

Carriage.—A ſmall ſpecies of wooden or brick aqueduct, built open, for the purpoſe of carrying one ſtream over another: this is the moſt expenſive conveyance belonging to watering.

Drain Sluice, or Drain Trunk.—Such as are placed in the loweſt part of a main, as near to the head as a

The moft fuitable foils for being watered are thofe that are of a fandy or gravelly friable nature, as the improvement is not only immediate, but the effects more

drain can be formed, and fituated low enough to drain the main, &c. It is placed with the mouth at the bottom of the main, being let down into the bank; and from its other end a drain is cut to communicate with fome trench-drain that is neareft. It is a contrivance ufed to carry off the leakage through the hatches when they are fhut down, to convey the water to other grounds, or to repair the main, &c.

Hatches are floodgates, and applied to the fame purpofes: they are, of courfe, variouſly conſtructed. A particular kind, which have about a foot, to take off, fo as to permit the water to flow over that much of the hatch where it appears to be ufeful in irrigation is a very good fort.

Head Main.—This is that part of the principal ditch which takes the water firft out of a river or ſtream, for the purpofe of diſtribution through its fmaller ramifications.

Small Mains.—Thefe are the next gradations of ditches applied to diſtribution, by means of their communication between the head main and trenches.

Trench.—The laft diſtribution ditch in watering, continuing to decreafe its dimenſions as it ſpreads the water over a greater extent of ground.

Trench Drain.—A deep ditch, or drain, which meets the trenches for the purpofe of taking the water away ſpeedily after the irrigation is performed. It ſhould be cut parallel to the trench, and as deep as the tail-drain water will permit, if poſſible ſo as to reach the ſtratum of ſand, gravel, or clay. Its gradations are exactly the reverſe of the trenches, which it meets in the manner of two forks placed with their points into each other at regular diſtances. Its parts, of courſe, increaſe as it receives ſucceſſive ſtreams to be drained off.

Tail-Drain.—The principal ditch which conveys the water out of the meadow. It receives that which all other drains diſcharge, and ſhould conſequently lead to the loweſt poſſible point of diſcharge, and the neareſt direction which the ground under every circumſtance will permit. When uſed as a fence-ditch it anſwers a double purpoſe.

Pane.—Signifies the part of ground containing the graſs to be mown between the trench and trench-drain.

Way-Pane.—The ſtrip of land left for cartage along the ſide of the main, being watered from the banks of the main, and drained by a parallel ditch.

Bend.—A ſtoppage made in various parts of thoſe trenches which have a too quick deſcent, in order to check the water and force it out of the trench. This is done by having ſmall dams of the natural ſward at proper places, and cutting a ſod out of them wedge-ways, ſo as to ſtop the current and give a more equal diſtribution to the water.

Gutter.—A ſmall groove cut from the tails of the trenches occaſionally, to diſtribute the water to the utmoſt extent of the panes more equally than by the regular works.

Catch-Drain.—An occaſional ditch which is ſometimes cut to carry the ſame water into a ſecond main, for the purpoſe of irrigating a lower meadow, or pane, with the ſame water which has been uſed.

Pond.—Is applied to any ſpot of ſtagnant water which is left on the ground in the proceſs of irrigation.

Turn of Water.—As much as can be diſtributed at a ſingle operation by the management of the hatches within the reach of the labourers employed, and as the ſtream will ſupport.

Head of the Meadow.—That part into which the main firſt enters.

powerful than on other ſorts of lands. Some ſtrongadheſive ſour wet lands, ſuch as are common in the vicinity of large rivers, are alſo capable of being improved by watering; but the beneficial effects are not in theſe caſes ſo ſoon produced as on thoſe of the above kind, nor is the proceſs ſo advantageous to the farmer, on account of the very heavy expenſe to which he muſt, in many caſes, be put by previous draining. Such lands as contain coarſe vegetable productions, ſuch as heath, ling, or ruſhes, may alſo be greatly improved in this way. There is another circumſtance in regard to the different ſoils that may be benefited by irrigation, which is, that the more tenacious the ſoil is, the greater the command of water ought to be.

A ſtream capable of watering fifteen or twenty acres of light dry land, would be found to be beneficial in but a ſmall degree if applied to watering half the ſame extent of cold clay ſoils, ſuch as in their natural ſtate abound with ruſhes. All ſoils of the laſt ſort require a conſiderable body of water for the purpoſe of floating them, in order to produce much effect. If this caannot therefore be procured, ſuch means of improvement will ſeldom anſwer the farmer's expectation, or turn out to much account.

Thoſe grounds which admit of being benefited in this way with the moſt ſucceſs are ſuch as lie in low ſituations, on the borders of ſtreams or rivers, or in ſloping directions on the ſides of hills, to which water can be conducted in the manner directed below.

It is neceſſary, before entering upon works of this kind, to conſider, whether the ſtream of water to be employed will admit of a temporary wear or dam to be made acroſs it, ſo as to keep the water up to a proper level for covering the land without flooding or injuring other adjoining grounds; or if the water be in its natural ſtate ſufficiently high without a wear or dam, or to be made ſo by taking it from the ſtream higher up more towards its ſource, and by the conductor keeping it up nearly to its level till it comes upon the meadow or other ground. Further, if the water can be drawn off the meadow or other ground as rapidly as it is brought on*. Beſides theſe, having attended with care to all ſuch other difficulties and obſtructions as may preſent themſelves, from the lands being in leaſe through which it may be neceſſary to cut or form the *mains* or

Tail.—That part where the water laſt paſſes off by the tail-drain into the natural river, or ſewer; or where that ſewer itſelf leaves the meadow.

Upper Side of a Main.—That which, when made at nearly right angles to the river, fronts the point a which the river enters.

Lower Side.—The reverſe of the above.

Upper Pane.—That which lays above the main, if ſuch be left.

* Wright on Floating Land.

grand carriers, from the water being neceſſary for turning mills, from the rivers or brooks not being wholly at the command of the irrigator, and from ſmall necks of land intervening, ſo as to prevent the work from being performed to the greateſt advantage, the operator may be in a ſituation to commence the buſineſs of irrigation.

This is to be done by the uſe of a *ſpirit level*, beginning from the higheſt part of the land that the ſtream can be commanded from, where the grounds on the different ſides are the property of the ſame perſon, and wears or other works, as has been juſt obſerved, can be carried acroſs the ſtreams for the purpoſe of forcing the water, either wholly or in a partial manner, into a different courſe. After it has been raiſed as high as poſſible in this way, the level is to be formed from the ſurface of the water, carrying it on what is termed the *dead level*, and marking it out, at certain diſtances, by two rows of ſticks or ſtakes well driven down, one on the line of the dead level and the other oppoſite to it, at ſuch diſtance below as may be ſufficient to allow for the proper flowing of the water: a few inches in the mile will be ſufficient to draw it; but from a foot to a foot and a half or two feet in that length may be requiſite to afford a proper fall; and where interruptions preſent themſelves, from buildings or other cauſes, a ſtill greater fall will be neceſſary, in order that the paſſing of them may be provided for in a gradual, not a ſudden, manner. It is proper to proceed in this way to the extent of the land that is capable of being watered. And when neceſſary, the level on the land upon the other ſide of the ſtream may be ſet out in a ſimilar manner.

After this has been done, the land on the different ſides of the ſtream, below the lines ſet out by the level ſhould be minutely examined and inſpected, as the whole may be irrigated if the command of water be ſufficient. The extent that can be properly performed muſt, however, depend much on the degree of fall or deſcent from the entrance of the water and its out-fall, as well as on the declination of the more elevated parts of the ground. It, however, generally happens that a much greater ſpace of land can be covered with water than was at firſt ſuppoſed.

The next circumſtance of importance is that of deciding where to commence the buſineſs. This muſt depend on various points, which can only be ſettled by the judgment of the operator. If there be a full ſupply of water, the whole ſhould be covered; but in the contrary caſe, the expenſe of cutting the mains or carriers on ſuch levels in a ſufficient manner ſhould be conſidered; and where one ſide of the ſtream is better adapted to the purpoſe than the other, that on ſuch ſide ſhould be the firſt executed, And if the land moſt adapted to the purpoſe of watering be at much diſtance from the place whence the water is firſt taken, and there is not a

fupply for the whole of the land below the line of level on one of the fides, the expenfe of forming the carrier fhould be put in comparifon with the greater advantage of irrigating the moft fuitable grounds, in preference to others that are nearer, without poffeffing equal advantages. It moftly happens that the beneficial confequences of irrigating at command are fuch as to overbalance that of forming the mains or carriers. Befides, though the fupply of water may be infufficient in fuch feafons as are very dry, as it may be abundant in the winter time, the fimply covering the land at that period may be more than adequate to the expenfe of the bufinefs; which is a circumftance that may render it more beneficial to lengthen the carriers, than by having them fhorter to be confined to the watering of fuch lands as are lefs proper for the purpofe. It is probable alfo, that in particular cafes the winter irrigation may extend through the whole of the level that has been fet out.

Where it may happen that there are a great variety of different forts of land below the line of level, fuch as low, flat, wet meadows, extended on the borders of the river, having paftures with dry, gravelly, or fandy tillage lands higher up, and moory or heathy grounds, fo that the operator has it in his power to perform the bufinefs, at his option, on different forts of land, it is too frequently the cafe to begin with the low grounds that admit of improvement in other ways, as by draining and proper manures of the foffil kind, and that are not only the moft difficult and expenfive in the execution, but often the leaft advantageous in the produce afterwards, except when the bufinefs is performed with uncommon correctnefs. Therefore, in examining fuch grounds as are fituated below the mains or carriers, the irrigator fhould fix upon fuch lands as are, from the nature and condition of the foils and the fmallnefs of their value, capable of affording the greateft and moft fpeedy improvement and advantage. In moft cafes thefe will be found to be the more dry declining parts in the ftate of tillage, and the old worn out dry paftures. And in fome inftances the heathy and moory lands may be felected for this purpofe with great chance of benefit.

Where it can be done, it is beft to begin with fuch parts as are contiguous to, or approach the neareft, the mains or carriers; and, after having paffed the water over them, to mark the loweft places, where it can be carried off to the beft advantage; and from fuch parts it fhould then be feen to which other lands the water can be conducted with the greateft facility and benefit. Where the natural fhelving of the ground is conficderable, lefs care is neceffary; but where this is not much, it may often be requifite to convey the water in a flanting direction for a conficderable way, before lands fufficiently low for being covered by it are met with; as in

this ſort of buſineſs it is invariably neceſſary, in order to prevent the waſte of water, to proceed with that which is firſt made uſe of to its final outlet into the river before the works on other diviſions are commenced.

On extenſive ſloping tracts of land managed in this way, it of courſe moſtly becomes neceſſary to convey the water in a ſlanting direction acroſs them. And an opportunity is thereby afforded of throwing it over the lands in the intermediate ſpace, between the bed of the river and the *maſter drains or carriers*, and in this way one ſpace or diviſion of ground may be ſupplied after another, and the water conducted at pleaſure to any given point, thereby enabling the operator to ſupply or omit any ſpace or field that he may think proper, but ſtill by this means preſerving the regularity of the plan, which at any future period may be perfected.

In this view the moſt material circumſtances to be attended to are the abundant ſupply of water and the quickneſs of its being conveyed off, as by its ſluggiſhneſs or ſtagnation much miſchief may enſue.

It is an advantage in this oblique or ſlanting method of watering, that it may be performed to advantage with a *ſmaller ſupply* of water than in others; as where that is the caſe it may be directed to ſuch ſpaces only as it will be equal to, but when more abundant, it may be ſuffered to overflow the whole at the ſame moment.

And it is too frequently the caſe that the trenches and drains are ſo injudiciouſly made as to take off the water without the poſſibility of uſing it a ſecond time; and there are other inſtances of its being conveyed into ſlopes without any care of its future courſe, thereby producing great inequalities in its conſequent effects. Theſe points ſhould, therefore, be conſtantly attended to, and avoided as much as poſſible.

When the piece of ground to be floated is ſo much upon the level that the deſcent cannot eaſily be determined by the eye, it will be neceſſary to take an accurate level, and compare the higheſt part with the ſtream intended to be uſed, by which the degree of fall from the ſurface of the water to the higheſt point of the land will be aſcertained: and in order to convey the water to this point, ſhould it be diſtant from the ſtream, the ſides of the ditch or canal ſhould be ſufficiently raiſed for the purpoſe not to keep the water in a dead level, but with ſuch degree of deſcent as the two points will admit of. In the operation of cutting this canal or main feeder, it will be eaſy to preſerve the proper degree of fall, having previouſly aſcertained the length; for inſtance, in cutting fifty yards with a fall of five inches, it will be obvious that in every ten yards a deſcent of one inch ſhould take place, this is neceſſary to keep the water in a conſtant lively motion. In ſome caſes it may be neceſſary to have two main feeders, in order to effect a more equal diſtri-

bution of the water; the depth and width of which feeders muſt be regulated by the ſupply requiſite for the ſmaller gutters. Near to the mouth of the canal or feeder it will be proper to have a flood-hatch or *clow*, by which the water may be admitted or excluded at pleaſure.

In forming the floating gutters, it is perhaps the beſt method to cut them at right angles to the feeders; however, where the ſurface is uneven, in order to preſerve a regular deſcent, a different direction muſt be given to them, the diſtance from each other being about ten yards, and the gutters becoming, as has been obſerved, gradually narrower as they recede from the main canal or feeder. The object in view being to throw the water as evenly over the ſurface as poſſible, theſe gutters ſhould be ſo conſtructed that the water which has been introduced may overflow their little banks rather than run rapidly along the bed. Obſtructions may ſometimes occur, ſuch as low parts, or deep ditches, over which a pipe or ſpout may eaſily be made to continue the progreſs of the water; and ſuch as proceed from ridges, roads, or ſmall eminences, by trunks or other contrivances made to convey the water underneath them.

The neceſſary preparation for the introduction and ſpreading of the water being made, it will be proper to form drains to receive and carry off the water in nearly the ſame proportion that it has been introduced; which is to be done by drains running parallel to the gutters at even diſtances from each, or, as the irregularity of the meadow requires, being made narroweſt at the higheſt part, increaſing in width as they approach the loweſt (which is the reverſe of the preceding works), until they arrive at the main channel that takes off the water that has been collected.

On the completion of theſe works, when the water is firſt introduced, it may, perhaps, be found that it will not ſpread itſelf evenly: this may be regulated by ſtops acroſs the feeders or floating gutters, at ſuch places or diſtances as the operator may find neceſſary; theſe ſtops may be made by putting down a ſtake at each ſide of the water and placing a board before them, thereby raiſing the water to ſuch heights as may be required*.

Some adviſe, that when the lands are quite level, or nearly ſo, ridges of about eleven yards wide ſhould be formed by the plough, and raiſed about three feet on the crowns; it will be of courſe neceſſary to uſe the ſpirit level in their formation, as well as in that of the top trenches for receiving the water from the *main carriers*; and that

* Boſwell on Water Meadows.

PLATE XXI.

Irrigation.

[*To face Page* 928, *Vol. II.*]

Fig. 1. Explains the method of watering in an oblique direction over the ſpace between the grand carrier and bed of the river, as deſcribed by Mr. Young. In which "1 is the river; 2 the grand carrier; 3 the field firſt watered; 4 the field watered after the firſt; 5 and 6 ditto, in ſucceſſion; 7, 9, the *priſe d'eau*; 8 a ſluice to throw the water into the field where firſt uſed; 10 final exit of the water. But in this reſpect the variations may be as many as the forms which a tract of country preſents. 6 may be a good meadow already: in that caſe the water may run to waſte in the ditch 11, and ſo find its way to the river."

Thus, "the diviſions 13, 14, 15, 16, 17, form a diagonal ſyſtem.

The others, 18, 19, and 20, another.

21 and 22, another.

23 and 24, another.

25, 26, and 27, another.

28 and 29, 30 and 31, others.

32 and 33, by themſelves, the one from the carrier, the other from the ditch between it and 28."

Fig. 2. Repreſents a watered meadow deſcribed by Mr. Young, where the ſlope from A to B is regular, but which is not material to the buſineſs. In this caſe, if "the water from the main carrier, river, or ditch, 31, be let into the delivering trench 32, and the ſtop 33 be let down, the water will flow over the pane or diviſion of the meadow 1. The delivering trench 34 then acts as a drain, and conducts the water into the trench 35, the ſtop 36 being let down; thence, of courſe, it overflows the pane No. 2, and in like manner, ſucceſſively, No. 3, 4, and 5. If the ſtop 33 be drawn up, and the ſtop 37 let down, the panes 6, 7, 8 and 9, are watered in the ſame way; and ſo on by the ſtops 38 and 39, which will water the panes 10, 11, and 12; alſo 13 and 14: and the ſtop 40 being let down, and 41 drawn up, the pane 30 will be watered. Then returning to the ditch at the other end of the field, and letting down the ſtops 42 and 43, the water will flow into the trench 34, and the ſtop 44 being down, the pane 15 is watered, and the trench 45 becomes a drain, which, ſucceſſively, conducts the water, as above explained, over the panes 16, 17, 18, and 19. And when the trench 46 becomes ſupplied with water, and the trenches 34 and 45 are empty, the panes 1 and 15 are in a perfect ſtate of drainage; which ſufficiently explains the ſyſtem, and ſhows how every trench operates, either for delivering or draining off the water, at the pleaſure of the irrigator."

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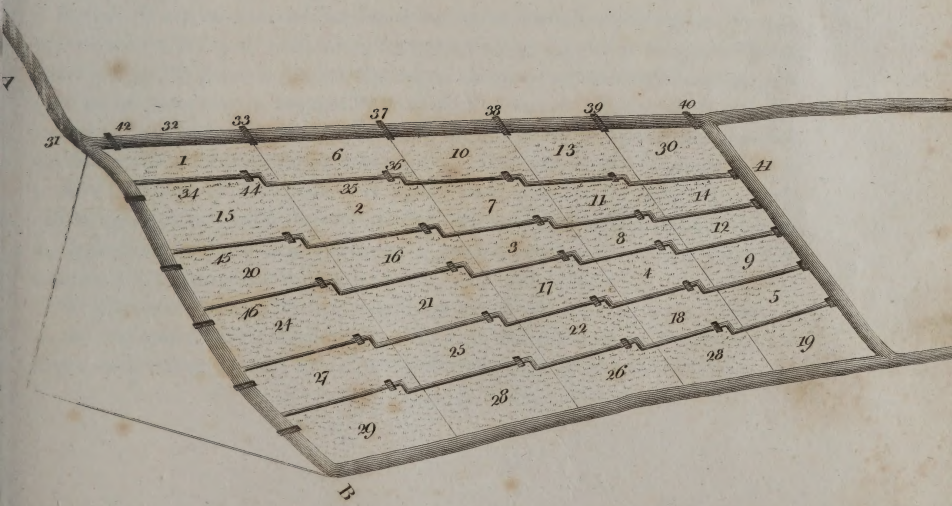
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the drains on the ſides may be properly conſtructed to convey it to the ditches. The trenches ſhould be cut in a direction verging nearly to a point, in order to give an equal overflow of water the whole length : but where the land is ſloping, trenches alone will be ſufficient, cauſing an overflow in each direction.

It is further neceſſary, in attempting to improve meadows or other lands by the application of water, to aſcertain that both the ſoil and ſubſoil are naturally dry, or have been made ſo by open or under drains, otherwiſe they cannot be benefited by watering, as has been found from much experience. Of courſe the previous operation of draining is indiſpenſably neceſſary, before lands in which there is much moiſture can be flooded with any probability of ſucceſs. The perfection of watered meadows conſiſting in the operator's having it in his power to let on or take off the water at pleaſure, it follows, of courſe, that a complete power of drainage is as requiſite as the command of water.

The length of time which meadows ſhould remain floated, and the neceſſary repetitions of the floating, muſt obviouſly depend on various circumſtances: but as after every watering, the floater ſhould be extremely careful to drain off the water from every part of the land, and as the moſt prejudicial conſequences are known to reſult from any degree of neglect of this kind, it would be an uſeleſs expenſe to prepare a field for being floated, unleſs previouſly aſcertained that it poſſeſſes ſufficient declivity for carrying off the water when its continuance may be attended with injurious effects. In forming meadows of this kind, the drains that are to carry off the water, when no longer neceſſary, ſhould therefore be as carefully attended to as thoſe by which the water is to be brought on.

In ſhort, it may be obſerved that this operation, as has been already ſhown, may be applied with utility to all thoſe low-lying lands that are capable of being overflowed directly from the rivers or ſtreams that adjoin them, or on which conſiderable proportions of water may be brought by a cut from a river at a higher level than the ſurface of the meadows, or the tops of the ridges ; if ſuch preparation for watering has been made, the water being ſo conducted to the neareſt part of the meadow, it is there branched out by a number of ſmaller cuts, made for the purpoſe. Theſe cuts being filled with water, forced into them with as much rapidity as poſſible from the main cut, overflow their banks, and a general flooding enſues over the whole meadow if ſufficient water be procured.

Where watered meadows are ridged up drains are made in each furrow to receive the water which overflows the little cuts that are made on the tops of the ridges, and, falling into the drains in the furrows, runs off into the tail drain, and

which may be uſed to water ſome adjoining field, or reconducted to the river; ſo that, when the drains are properly formed, by ſtopping the inlet the field may be immediately laid dry. This is moſt expeditiouſly done where croſs drains are made from thoſe on the tops of ridges, ſo that the water is conducted into the drains in the furrows as ſoon as the main drain is ſhut. On meadows whoſe ſurfaces are irregular, and where an abundance of water cannot be procured, the cuts neceſſary to flood it can only be determined by the ſkill of the operator.

There is another deſcription of watering, uſually denominated *Catch-work*, which is applicable to ſuch meadows, graſs and paſture lands as are ſituated on the ſides of hills, and capable of being watered by conducting the water of ſome ſtream round the edges of the hills. The method of watering ſuch lands differs from the former, as fewer cuts are neceſſary, and theſe as nearly in parallel lines below each other as the bank will permit; the water by the main-cut having arrived at the top of the piece of ground, it begins to run over, overſpreading all the ſurface in its courſe, and falling into the cut immediately below it, which, becoming full, diſcharges itſelf in the ſame manner into the next, and ſo on, till at laſt the water arrives at the bottom of the field, and falls into a drain made for the purpoſe of carrying it away, or conducting it to other grounds on lower levels.

In all caſes where the watering ſyſtem is undertaken, except in the time of floods, it may be highly uſeful to diſturb the mud and dirt in the bottom of the *main carriers*, or drains, before watering, a practice frequently adopted on the continent. Lime has alſo been thrown into theſe cuts by ſome irrigating farmers, and raked with a heavy harrow or other implement at the bottom, which is a proceſs that will be found to add conſiderably to the manuring quality of the water. It is probable that many other ſubſtances might be employed in the ſame way, and be thus ſpread over the ſurface of graſs lands in a minute ſtate of diviſion, with vaſt advantage in promoting vegetation.

There is another method which ſeems capable of affording advantage in this buſineſs, eſpecially when the lands are not well ſet with graſs plants, which is that of ſowing them with ſuitable graſs ſeeds before the proceſs of watering is commenced; but in theſe caſes the water ſhould not be continued flowing too long at a time, as by that means the vegetative power of the ſeeds might be deſtroyed. A good ſward might probably ſoon be formed in this way.

To form meadows in a proper manner for watering is attended in many caſes with conſiderable expenſe, but varies, according to circumſtances and the nature of the irrigation, from ſix to twenty pounds the acre. Catch-work meadows from three to ſeven, beſides the annual expenſe of implements and labour. In order to

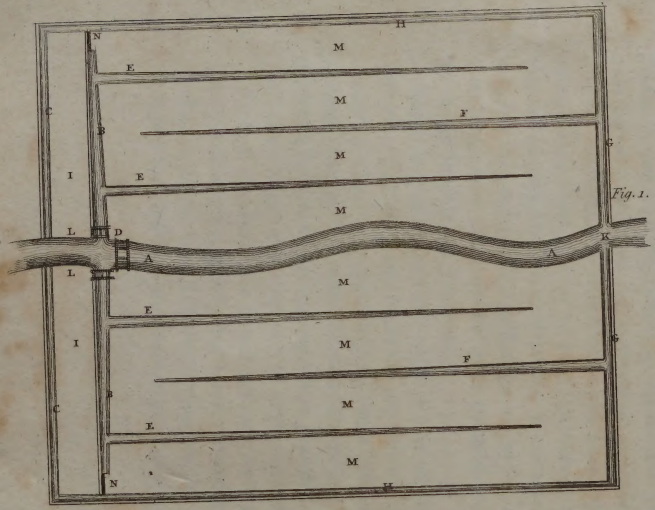


Fig. 1.

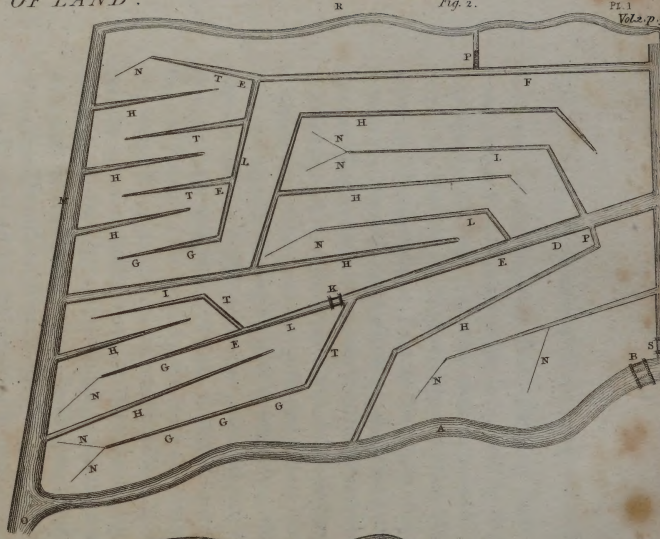


Fig. 2.

Fig. 3.

PLATE XXII.

Watering of Land.

[*To face Page* 930, *Vol. II.*]

Fig. 1. A, A, Repreſents the river running through lands. B, B, Two mains drawn at right angles with the river, one running north, the other ſouth, acroſs the meadow to within about ſix yards of the fences. C, C, fence ditches at the head of the meadow, uſed for tail-drains to convey the water that runs over the way-panes, I, I, watered from the upper ſide of the mains, B, B; by theſe fence-ditches the water is conveyed into the ſide-fence ditches, H, H, to the tail-drains, or lower fence-ditches, G, G, and diſcharged by them into the river A again at K. D, a wear erected acroſs the river to force the water into either of the mains, B, B, which is done by ſhutting the wear D cloſe. L, L, two wears erected at the mouth of each of the mains, B, B; their uſes are, when the wear D is ſhut cloſe, and there is not water enough, or it is not convenient to water both parts of the meadow at once, by ſhutting cloſe one of theſe the current is forced into that main whoſe wear is open, thence to be conveyed through the trenches over the panes, to water that ſide of the meadow; then by ſhutting that, and opening the other, the oppoſite main, B, is filled, and by means of the trenches that ſide of the meadow is watered in the ſame manner; and laſtly, by ſhutting them both, and opening the wear D, the water flows in its uſual courſe, and the land on both ſides is laid dry. E, E, E, E, trenches taken out of the mains B, B, to convey the water over. M, M, M, M, M, M, M, M, which are the panes or parts of the meadow that produce the graſs. F, F, are trench-drains to draw off the water from the panes, and convey it into the tail-drains. G, G, the weſt fences of the meadow, here uſed for tail drains to convey the water into the river. K, the place where they diſcharge themſelves into the river. N, N, two drain ſluices, one at the lower end of each main, uſed when the wears L, L, are either or both of them ſhut cloſe; theſe drain ſluices are opened to convey the leaking out of the mains into the fence-drains, H, H, to keep the land dry and healthy. I, I, are the way- (or road-) panes, watered from the banks of the mains B, B, the whole length of the mains.

Fig. 2. A, the river. B, a wear erected acroſs the river. C, the head main taken out of the river above the wear B. S, a wear erected acroſs the main C, to be kept cloſe when the meadow is not watered. D, a ſmaller main, taken out of the head main C. F, another ſmall main, taken out of the head main C. E, E, E, E, bends made in the ſmall mains, and trenches juſt below the places where the branch-trenches are taken out of them, to check the water at thoſe places, and force a proper quantity into branch-trenches. G, G, G, G, G, G, bends made in thoſe branch-trenches which have ſo much deſcent that, were it not for theſe bends, the water would run down almoſt to the end of the trenches before it would flow over the panes. H, H, H, H, H, H, H, H, H, trench-drains to convey the water off from the panes. There ſhould be one on each ſide of every trench, unleſs a fence-ditch, or the river, can be uſed inſtead. P, P, ſluice-drains, to convey the leaking of the water out of the mains D and F. L, L, L, L, trenches taken out of the ſmall mains, to convey the water into the various parts of the meadow, which at the lower part increaſes in width. T, T, T, T, T, branch-trenches, taken out of the other trenches. N, N, N, N, N, N, N, N, N, various gutters taken out of the ends of ſome of the trenches, to carry the water to the longeſt corner of the panes, and ſometimes taken out of different parts of the trenches, to water ſome little irregularities in the panes, which without ſuch aſſiſtance would not have any water upon them. I, a maſter or conſiderable drain, into which ſeveral others empty themſelves, and thence run into the tail-drain. K, a ſluice, erected at the end of the ſmall main D, to force the water into the branch-trench T, that being the higheſt ground. M, the tail-drain, which receives all the water from the other drains, and conveys it into the river at O, the point where the water from the tail-drain runs into the

river. R, a fence ditch, being the bounds of the meadow on that side, and used also as a drain to convey the water into the tail-drain.

Fig. 3. A, the head main, taken out of the river, forming an angle of about 60 degrees. The descent of the land permits the main to overflow it at B, the point where the meadow can be watered; consequently the place for the main B B to be drawn, at right angles with the stream, the whole breadth of the meadow intended to be watered, excepting about five yards at each end. C, D, two wears erected to turn the water either way; or, when both are shut, to keep it in its proper current. E, another wear for the purpose of dividing the meadow into turns. F, G, H, I, K, L, AD, sluices to convey the water into, or stop it out of the trenches, as found necessary. M, N, two drain sluices. O, P, Q, R, S, T, V, W, bends to stop the water in those trenches which have the quickest descent. X, Y, Z, a, b, c, d, e, f, g, h, i, k, gutters to carry the water to the ends of the panes, and little irregular parts in the meadow. C C the lowest part of the meadow, where water is conveyed away. From the main B B to the principal drain A B, the meadow is watered regularly; but betwixt that drain A B and the small main A C, there is a great flat. To fill it up would be the regular method, so that the trenches taken out of the main B B should go down to the end of the meadow; to avoid that expense, the main B B is continued down on the east side of the meadow, till it has passed the flat grounds to F. Materials being had from the drains, &c. to raise the ground high enough to convey the water in the main on to F; which being the high ground, it is then carried east and west, the same as the main B B. Trenches are taken out of it, to water the lower part of the meadow. Trenches are also drawn out of the main that runs north and south, to water the flat part the opposite way; with drains between them to carry off the water into the west fence ditch: at E a ware is built to stop the water, and turn it into the trenches above it; at F a sluice is placed to turn the water into the main A C. For the same reason, the sluices A D and K are set at the mouths of these trenches to force the water down to the lower divisions of the meadow. The trench-drains AE and AF convey the water from the upper pane of the main A C, and also from one of the cross trenches A H. And A F and A B do the same from the other cross trench A G. To water this meadow it will be necessary to divide it into two, or perhaps three turns, if water should be scarce. One turn will be made by opening the wear C, and shutting that at D; the sluices G and H being also opened, the water will flow over the lower side of the main B B from D to M, down all those trenches that are taken out of it; and will be carried off from the trench-drains by the principal drain AB to CC. Thus will that part of the meadow be watered. Another turn is made by shutting the wear C, opening D, and shutting E. The sluice H being stopped, and the sluices I, AD and K opened, that division of meadow from the wear D to E will be watered, and the panes on each side of the main BB also, by the water flowing over its banks as it passes along; which is carried off on the one side by the river, on the other by the principal drain AB; and also from the panes on each side of the trenches AG and AH, by the same drains AB, and the trench-drains AF and AE, into the west fence drain to CC. The other turn is made by shutting the sluices I, AD and K, opening the wear E, and so much of the sluices F and L, as will let water enough through to supply the trenches below them; keeping that at F partly in, to turn the water into AC; and that at L the same also, partly to check the water, and force it over the sides of the small main A C, and into the trenches 1, 2, 3, 4. The reason for putting the sluice across the small main AC at L is, that part is supposed to be flat ground from L quite to CC; consequently, the water would, if not prevented, run so fast down to the ends of the trenches 5, 6, as to draw all off from the high grounds, from L upwards. The small main AC is too wide to be checked by a bend at that place; besides, it would not answer so well to regulate the quantity of water necessary to water the panes from L to CC; and it is on the account of those trenches 5, 6, that a sluice is built. The water which runs out of this meadow at C C is, if the descent is quick, immediately made use of to water the next meadow below; or if there should be but little descent, it is oftentimes considered as a head main; and wherever below it will rise over the land, it is again made use of, in the same manner as it was at first in this plan of watering.

Fig. 3.

Fig. 4.

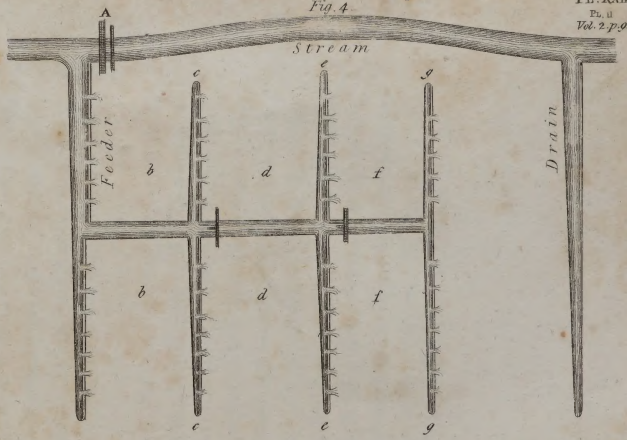
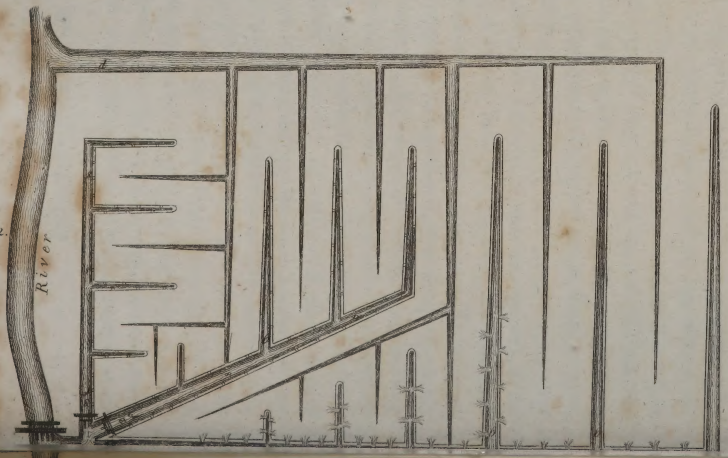


Fig. 2.



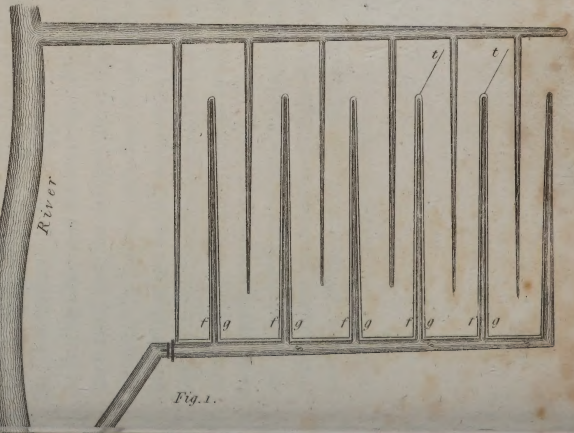


Fig. 1.

overbalance ſo great an expenditure, great and permanent advantages ſhould be the conſequence. However, in ſome inſtances this does not prove to be the caſe, eſpecially when the ſoil and the water are not both well adapted to the purpoſe. But, as ſuch caſes ſeldom occur, it may be generally ſaid, that it is an important means of improvement, whether the object be hay or paſturage.

The great degree of verdure and luxuriance which almoſt immediately ſucceeds the occaſional covering of graſs lands with water, ſufficiently demonſtrate the power which it poſſeſſes in promoting vegetation. It is a means of fertility that has been employed for ages in more warm climates, with the moſt beneficial conſequences in increaſing the quantity of vegetable produce. But though it has been long in uſe in other countries, and of late more particularly attended to in this, the principle on which it produces its effects does not ſeem to be fully underſtood. In ſpeaking of manure as the food of plants, we have already noticed ſome of the properties of this fluid that may be uſeful in the vegetable economy when taken up by the fibrous roots of plants; and there are ſtill other ways in which it would ſeem to be advantageous in forwarding the growth of graſs crops.

In climates where the heat is conſiderable it may be of much utility, not only by keeping the fine fibrous roots of the graſs or other plants in a moiſt patulous ſtate, the moſt proper for the purpoſes of abſorption, but in ſuch a temperature or ſtate of heat, from the cooling effect produced by the conſtant evaporation that is taking place near the ſurface of the ground, as is the moſt ſuitable for their healthy and vigorous growth. It is probably in this way that garden plants are principally benefited by the application of water in the hot ſummer ſeaſons in our own climate; as when the waterings are not conſtantly kept up, injury rather than good is moſtly experienced.

But another and more beneficial way in which graſs produce may be immediately increaſed, and the fertility of the lands more permanently improved in this country by the floating or covering them with water, is from the waters of the rivers or brooks that are turned upon them containing, either in the ſtate of ſolution or diffuſion, a variety of different ſorts of enriching materials which they gradually and evenly depoſit upon the ſurface while they reſt upon or ſlowly flow over it. This muſt be the caſe in all thoſe inſtances where the rivers or ſtreamlets either ariſe in, or in their courſe flow through or over, beds of chalk, marl, or other calcareous ſtrata; as in their paſſage they become highly impregnated with the fine particles of theſe different ſubſtances. And where they are fed by the ſmall runlets which receive the waters that proceed from the higher and more elevated

lands, they muſt often, eſpecially after heavy rain, be loaded with a large proportion of fine rich materials of the animal, vegetable, or other kinds, which they depoſit in a regular manner in their tardy trickling courſe over the ſurfaces of the fields.

But it would appear that waters thus impregnated produce the moſt beneficial effects, particularly when not in flood, upon the lands that are the neareſt to the ſources whence they become principally impregnated with their fertilizing principles; as when they have flowed to ſome diſtance they have, in a great meaſure, depoſited and let fall ſuch enriching ſubſtances, and are become too pure for affording advantage in the way of depoſition. It is only in the time of floods that they can produce much utility in this way at any great diſtance. It was found by an able philoſophical writer, that the water of the Darwent, though it flows for ſeveral miles, near Matlock, through calcareous ſtrata, contained no impregnation of this ſort on its reaching Derby, although the ſprings in that neighbourhood had a large proportion of it in their compoſition *.

The ſame author has ingeniouſly ſuggeſted another mode in which water may prove ſerviceable in floating grounds in this climate, which is that of protecting the graſs or other plants from the too ſevere effects of cold during the winter or early ſpring ſeaſon. In this view it is obſerved, that the water of ſtrong ſprings, which in this country have conſtantly the temperature of forty-eight degrees of Fahrenheit's thermometer, is to be preferred to that of rivers, where it can be procured in a ſufficient proportion, as the degree of cold in theſe is in the ſame ratio with that of the atmoſphere till it declines to the freezing point, or that of thirty-two. Though both when ſpread out, forming a thin ſheet of ice on the ſurface of the land, are beneficial in defending the roots of the graſs plants from too intenſe degrees of cold, and of thus preſerving them in a more healthy condition; and it is added, that thoſe of ſome ſorts of graſſes are ſuppoſed to even vegetate beneath the ice, as the rein-deer moſs in Siberia vegetates beneath the ſnow, in a degree of heat of about forty, which is the medium between that of the inferior ſurface of the diſſolving ſnow, or that of thirty-two, and that of the common heat of the internal parts of the earth, which is forty-eight; and in this manner the graſs produce in this cold country be conſiderably increaſed, ſo as, under proper management, to nearly double the uſual annual quantity under other circumſtances †.

In illuſtration of theſe principles it may be obſerved, that the water iſſuing

* Darwin's Phytologia. † Ibid

from ſprings where they abound with the particles of gravel, or a ſlaty mouldering kind of rock containing a large proportion of calcareous earth, are known from experience to be better adapted to the purpoſe than that which ariſes from others that do not contain ſuch materials. The difference in the effects, often ſo viſibly produced, has been accounted for, from watering one field from a ſpring iſſuing out of a chalky ſoil over thoſe which take their riſe in another, ſimilar in every reſpect and management, except that the water applied ariſes in, or flows through, a ſwamp or moraſs, compoſed chiefly of peat earth, or proceeds from ſituations known to contain none of theſe ſubſtances.

The fact is unqueſtionably eſtabliſhed, that the water of rivers which run through comparatively level and fertile countries is not only better than that of ſuch as have their courſes through mountainous, unproductive tracts, but ſuperior to all others, as every different ſtreamlet adds a new acceſſion of fertilizing materials, which, being diſperſed over the ſurface of the meadows in their fine and attenuated ſtate, cannot avoid adding a conſiderable degree of improvement to the lands.

Winter and ſpring are the two ſeaſons when meadows are uſually watered, as from the month of November till the beginning of March: the experience of the operator can alone regulate this proceeding as to the length of time they ſhould remain under water. In ſome diſtricts the water is allowed to flow over the fields for ſeveral weeks together, with only the interval of a day or two occaſionally; in others, the practice is to flood them the alternate weeks. When froſts ſet in, floating is uſually ſuſpended; but it has been remarked that in ſuch caſes the ſucceeding crop of graſs has been abundant. As the ſpring advances, much leſs floating is found to be neceſſary. However, in all caſes, when floating is performed to advantage, the meadows ſhould be laid dry between every watering.

On the ſandy, gravelly, and drier kinds of land, the water is directed not to remain ſo long at a time upon the land as in thoſe of the heavier kinds. In the latter ſorts Mr. Wright thinks three weeks long enough, but Mr. Boſwell adviſes a month, or even ſix weeks, in the firſt waterings, about November; but a ſomething ſhorter time for thoſe of the former ſort. In December and February Mr. Wright recommends the land to be let dry for the purpoſe of air for a few days, and in February particular attention is adviſed not to permit the water to flow over the ground many days together without being taken off, as there may be danger from white ſcum being formed; and if the land be left expoſed to froſt in its wet ſtate it may be injured in that way. Theſe different inconveniences, it is ſaid, may be avoided by

taking the water off in the day time, and turning it upon the lands during the night*. Mr. Boſwell does not, however, ſeem to apprehend any danger in this way.

About March there will moſtly be a ſufficient bite of graſs to admit the lands being fed by ſtock: the water ſhould, therefore, be turned off for a fortnight, to give it ſufficient firmneſs before they are turned in. During the following month the graſs may be eaten cloſe, but not later; as continuing it even for a few days in May would greatly injure the hay produce which is to be obtained both in quantity and quality. In the month of May, after the graſs has been fed down, the water ſhould be again turned over the lands for a few days †, by which the land is ſo moiſtened as to produce a full crop of hay. It is probable that with leſs cloſe feeding two crops of hay might frequently be taken with advantage. The firſt crop of hay from watered meadows, when cut ſufficiently early, is equally good with moſt other ſorts, but when let ſtand too long becomes coarſe and unfit for fodder ‡.

It has been obſerved on this ſubject by a philoſophical obſerver, that where the flooding of lands is continued ſome time, the water ſhould only be ſuffered to trickle or flow over it gently from the higher parts, and not ſtagnate upon it; as in the latter caſe the graſs roots are ſoon deſtroyed in the ſpring, and, that when ſuch materials begin to decay underneath the water, a white ſcum ariſes in conſequence of the air ſet at liberty by the beginning putrefaction, which has been ſuſpected as prejudicial to the graſs, but is rather the effect than the cauſe of the miſchief, and demonſtrates that the water has remained too long in a ſtagnant ſtate upon the ground, and requires to be removed or to have a freſh ſupply from the ſtream; but the former is probably the better §. The neceſſity of continuing the watering after it has been begun, in hot climates and ſeaſons, has been already mentioned; and there may be injury done to the graſs plants by the ſudden application of much water under ſuch circumſtances of great heat ‖.

The beneficial effects of watering meadows is obvious in producing an early and luxuriant vegetation, with proper ſoil and water, as appears by a compariſon made by thoſe who had an opportunity of ſeeing Mr. Bakewell's judicious application of this means of improvement on a piece of ground ſet apart for experiments in this branch of huſbandry. If they had purſued their ſurvey a little further, they might

* Wright on Floating Meadows. † Ibid. ‡ Ibid.
§ Darwin's Phytologia. ‖ Ibid.

have diſcovered, that while the Diſhley fields were covered with an almoſt perpetual verdure of the moſt nouriſhing graſſes, thoſe of the neighbouring farmer were famous only for the ruſhes and other weeds which they produced.

As the graſs of watered meadows is very forward in March and April, they are generally pāſtured in the ſpring with ſheep; and to thoſe farmers who keep them for breeding or fattening, it becomes almoſt invaluable from the ſcarcity of green food at ſuch times: after being flooded again in the latter end of April, they are ſhut during the ſummer for the hay crop. The after-graſs is eaten off in autumn with cattle, it being conſidered as very pernicious for ſheep to paſture on watered meadows. The Suſſex Report records a remarkable inſtance of its fatal effects: "Eighty ewes, from Weyhill fair, were turned into ſome fields adjoining a watered meadow: a ſcore of them broke into the meadow for a night, and were taken out in the morning and kept till lambing; they produced twenty-two lambs, all which lived, but every one of the ewes died rotten before May-day. The remaining ſixty made them ſelves fat, nor could a rotten ſheep be diſcovered amongſt them."

That the graſs of watered meadows ſhould be ſo nouriſhing to ſheep in the ſpring, and ſhould prove ſo deſtructive to them in the autumn, is not eaſily accounted for; but the fact appears to be eſtabliſhed beyond doubt. Mr. Boſwell adviſes, that no ſheep, except thoſe that are juſt fat, ſhould ever be ſuffered, even for an hour, in watered meadows, as they will infallibly rot them at any other ſeaſon than the ſpring, eſpecially if made from low, boggy, or ſwampy ground: "not ſo when made from dry healthy land."

On farms where it is convenient to have three or four meadows that can be watered, it will be found very advantageous; as while cattle are eating the firſt, the ſecond will be growing, the third draining, and the fourth under water *.

In Wiltſhire watered meadows are of conſiderable advantage to the farmers, as they afford an early ſupply of graſs for the forward or early breed of lambs, on which they begin to feed them about the middle of March, having previouſly withdrawn the water from the meadows and laid them as dry as poſſible. On a good crop of graſs of this kind five hundred couples may be fed for one day on an acre. The practice is to hurdle out, daily, ſuch a portion of the ground as is neceſſary, leaving a few open ſpaces in the hurdles through which the lambs may feed forward on the freſh graſs. The hours they are ſuffered to feed on this graſs are from about

* Boſwell on Water Meadows.

ten o'clock in the morning till five in the afternoon, when they are generally folded on the contiguous barley fallows.

This practice is ſuppoſed to have its advantages from its manuring a part of the farm without having recourſe to the dunghill, as well as in affording a very early ſupply of food for the ſheep at a ſeaſon when green food is ſcarce, and in being ultimately uſeful to the other ſtock, affording much manure, and thereby enriching other lands. It is ſuppoſed to be an improvement that every farmer ought to adopt and encourage, where ſoil, water, and ſituation are favourable.

A remarkable inſtance of the beneficial and fertilizing effects of watering was obſerved in the beginning of the autumn of 1796, when graſs that had not had the advantages of water was nearly burnt up. A cloſe of about twenty acres, which had been irrigated, had a moſt luxuriant after-graſs of from ſix inches to a foot deep. And a neighbouring incloſure of near forty acres afforded ſupport for three months to forty-ſeven horſes and bullocks, all which throve very well *.

Another proof is mentioned of the great utility of theſe meadows, in affording a moſt ſeaſonable ſupply of graſs to farmers at a time when they are moſt diſtreſſed for food for their ſtock. Forty acres employed in this way was found equal to the ſupport of 500 Wiltſhire ewes and lambs from the middle of March to the 1ſt of May, or about ſix weeks, and the improvement of the ſtock in that time one ſhilling a week, or three pounds fifteen ſhillings per acre. In ſome parts of Middleſex, five pounds' worth of hay might alſo be taken off the firſt week in May †.

On the whole, there can be little doubt of the great advantage of this method of improving graſs lands in ſituations where it can be conveniently made uſe of, and that it is capable of being applied in a much more extenſive manner than has been hitherto the caſe, by the operators properly availing themſelves of the occaſional falls of rivers and ſmall ſtreams, as well as of canals, in ſome ſeaſons ‡, is not to be diſputed, as by ſuch means water may often be diſtributed over vaſt tracts of land that have never yet been thought capable of admitting of ſuch a mode of fertilization; and, in

* Middleton's Report of Middleſex. † Ibid.

‡ Mr. Templer, of Stover in Devonshire, according to the Agricultural Survey of that diſtrict, experienced very conſiderable beneficial effects on a tract of marſhy land on the borders of his canal—It had produced from five to ten ſhillings an acre. After having it drained and levelled, by forming conductors for the overplus water of the canal during the winter floods, and diſtributing it by well-arranged ſluices, throwing the enriching particles upon the ſurface, he converted theſe marſhes into valuable verdant meadows.

others by having recourſe to damming them up; and the occaſional uſe of wooden pipes in the conveying it, when neceſſary, may be eaſily raiſed to heights ſufficient for conducting it over many more elevated lands, and thus promote their vegetation and produce in an incalculable degree.

On heathy moors and mountainous tracts this ſyſtem might often be applied with a proſpect of moſt ample advantage. Innumerable inſtances are daily occurring to the attentive obſerver, in traverſing theſe hills, of little rivulets or rills, inſufficient to form a regular courſe, ſpreading their waters, and providing a moſt beautiful

The method of conſtructing theſe diſtributing ſluices is, by a number of trunks placed at various diſtances, to each of which a plug is fitted; and when the floods ſwell the canal above the level requiſite for navigation, theſe plugs are taken out, and the water immediately overflows the ſurface of the meadows, being at any time eaſily reſtrained by replacing the plugs: ſimilar ſucceſs attended a like proceſs on lands in the upper line of the canal.

And, in the Agricultural Report of the North Riding of Yorkſhire, it is obſerved, "that on the northern margin of Ryedale and the Mariſhes, a range of limeſtone heights extend in an eaſtern and weſtern direction for many miles, but which, in width, is no where more than about four miles. This tract is entirely deſtitute of water, except what flows along the bottoms of the deep valleys by which it is interſected, and which are ſeveral miles aſunder; little relief can conſequently be afforded by ſtreams thus diſtantly and inconveniently ſituated to the inhabitants or cattle of the up-lands. A perſon of the neighbourhood, about thirty years ſince, deviſed the means of watering this tract by rills brought from the ſprings that break out at the foot of the far more lofty moorland hills that run parallel to and at the north of this tract, in ſome inſtances at about the diſtance of ten miles.

"Theſe ſprings he collected into one channel, which he wound about the intervening tract, according to the level of it, and along the ſides of the valleys, until he gained the ſummit of the arid country which he wiſhed to water: having accompliſhed this, the water was eaſily conveyed to the places deſired, and alſo to ponds in all the fields over a conſiderable tract of ground, in general falling with an eaſy and uniform deſcent to the ſouth. In no inſtance it is apprehended that more than two rills have been required to ſupply the tract between each of theſe interſecting valleys; and frequently one channel has been found ſufficient to convey the ſtream for ſeveral miles from its ſource; after which it forks off into two branches, to each of which more or leſs water is given, according as the country through which it has to paſs may require a greater or leſs ſupply.

"The firſt of theſe rills is ſaid to have been brought to Kirkby-moor-ſide about thirty years ago; ſince which time many others have been made. The original expenſe of each rill, which rarely exceeded 100l., was defrayed by a ſubſcription, proportioned to the benefit each perſon was to receive; and they ſtill continue to be ſupported by the ſame means, though in one inſtance, in a late act of parliament for the incloſure of a lordſhip through which one of theſe rills is conducted, a rate is laid on the land benefited by it, and means preſcribed for compelling, if neceſſary, the future payment of it."

It is well obſerved, that the "plan for thus watering a dry up-land country has much merit: it affords a wonderful accommodation to the occupier; increaſes greatly the value of the property; and though not applicable generally, might certainly be adopted with great advantage in various other ſituations."

verdure; thereby affording the fulleſt proof of what improvement might be effected by the judicious application of this fluid. It is not, indeed, improbable but that, by the aid of machinery, water may be forced up ſo as to be diſperſed at ſuch levels as cannot at preſent be eaſily conceived.

The ſame principles may be applied, in many ſituations, in conveying the rich liquors collected in ponds and reſervoirs about the farm-yards and buildings, that are too frequently waſted by evaporation or other means, over the adjoining fields, as has been practiſed by Mr. Fenna, in Cheſhire, and deſcribed in the ſecond volume of Communications to the Board of Agriculture.

The chief objection to this method of improving meadow lands is the firſt expenſe of the buſineſs; but if it be conducted in a judicious manner, this will ſeldom form any real impediment, as the almoſt immediate increaſe of produce will amply repay the improver. And the object of the cutting of the land is of little or no conſequence, if it be thereby made to afford additional ſupplies of food for the ſupport of ſtock, and at the ſame time contribute to the gradual improvement of the ſoil.

As the water in theſe caſes is in a conſtant ſtate of motion, it is not probable that any prejudicial effects ſhould be produced on the health of the inhabitants, though the practice ſhould be conducted on the largeſt ſcale.

Warping.—There is a mode of improving land by *warping*, or the admitting of the tide waters of large rivers near the ſea upon the lands for the purpoſe of depoſiting their rich materials, which are denominated warp, and in that way forming as it were a new ſoil. It is much practiſed in ſome parts of Lincolnſhire as well as Yorkſhire, and has been fully deſcribed by Mr. Young in his valuable Report of the firſt of these diſtricts. But as it can only be employed with advantage in a very ſlight degree upon graſs lands as a manure, and as its application has been already conſidered in the management of tillage ground, it does not appear neceſſary to deſcribe the practice more fully in this place.

Mowing of Hay Lands.—In the cutting of graſs crops for the purpoſe of being converted into hay, it is neceſſary that they be in the moſt ſuitable ſtates of growth and maturity for affording the beſt and moſt nutritious fodder. With this view, it would ſeem that they ſhould neither be cut at too early a period, or ſuffered to ſtand too long; as in the former caſes there will be conſiderable loſs in the drying, from the produce being in ſo ſoft and green a condition, and in the latter from a large proportion of the nouriſhing properties being expended. It is probable, therefore, that graſs, when mown before it becomes in full flower, while the rich

ſaccharine juice is in part retained at the joints of the flower-ſtems, is in the moſt proper condition for being cut down, as at that period it muſt contain the largeſt proportion of nutritious material, but which then begins to be abſorbed and taken up in proportion as the flowers expand and the ſeeds ripen, ſo as to conſtitute the meal or ſtarch of the ſeed-lobes, and is either diſperſed upon the land or ſed upon by birds, the graſs-ſtems with their leaves being left in a ſimilar ſituation to that of the ſtraw of ripened grain.

But there are other circumſtances beſides thoſe of ripeneſs to be attended to in determining the period of cutting crops of graſs; as in ſome caſes, where they are thick upon the ground, the bottom parts become of a yellow colour before the flowering fully takes place: under ſuch circumſtances it will always be the moſt adviſable practice to mow as ſoon as the weather will poſſibly admit; for if this be neglected there will be great danger of its rotting, or at any rate of its acquiring a diſagreeable flavour, and of becoming of but little value. Where graſs is very tall, as is often the caſe in moiſt meadows, it is liable to fall down and lodge, by which the ſame effects are produced. In this caſe alſo the mowing ſhould be performed as ſoon as poſſible.

But where there is nothing of this ſort, it appears evident that the moſt proper time for performing the buſineſs is when the graſs has begun to flower, before the ſeed-ſtems become hard and wiry; as at this period it would ſeem to contain the largest proportion of uſeful matter. Beſides, when let ſtand too long, the after-graſs is not only leſs abundant, but there is great loſs by the crumbling down of the ſtems in the different operations of hay-making*. The uſual time of cutting for hay in the firſt crop is from about the middle of June to the beginning of the following month, according to the nature of the land, and as the diſtrict is more early or late.

In the operation of mowing, the chief art conſiſts in cutting the crop as cloſe to the ſurface of the ground as poſſible and perfectly level, pointing the ſwaths well out, ſo as to leave ſcarcely any ridges under them.

In cutting rowen, or ſecond crops of graſs, more attention in theſe different reſpects will be requiſite than in the firſt, as the crops are moſtly much lighter and more difficult to cut, the ſcythe being apt to riſe and ſlip through the graſs without cutting fairly, except when in the hands of an expert workman. Crops of this ſort ſhould always be cut as much as poſſible when the dew is upon them, and as ſoon as ever there is a tolerable growth, as by waiting, the ſeaſon is conſtantly getting

* Corrected Report of Perthſhire.

more unfavourable for making them into hay; and when not well made this ſort of hay is of little or no value.

The quantity of ground that can be mown in any given ſpace of time muſt depend, in a great meaſure, upon the weight of the crop and the capability of the workman, but in general an acre is conſidered as a full day's work for a good mower.

When the graſs has been decided to be in the proper condition for being cut down, a ſet of mowers, proportioned to the extent of the crop, ſhould be immediately provided. In ſome diſtricts it is the cuſtom to pay theſe labourers by the day, but a better and more general practice is to let the work at a certain price by the acre. A ſuitable number of hay-makers are likewiſe to be obtained; in ſome caſes two or three are deemed ſufficient for each mower, but in this diſtrict the uſual number, including pitchers and ſtacker, is about five, who proceed with their work after the mowers, and are paid by the day. In hot or windy ſeaſons a larger proportion will be neceſſary than when the weather is cloudy and cool. About one half may be women. If a due proportion is not preſerved, much inconvenience and diſadvantage will ariſe in having too much cut graſs on hand to be perfectly managed.

Hay-making.—The great art in converting graſs into hay conſiſts in rendering it ſufficiently dry to prevent its taking on too great a degree of heat in the ſtack or mow, and at the ſame time preſerving a large proportion of the natural juice of the plants. Where this medium can be attained with the moſt exactneſs, the beſt and moſt nutritious hay will be produced. It is, however, a difficult point, that requires much care and attention. In fine ſeaſons the great danger is of not making it ſufficiently, while in thoſe of the contrary deſcription it is apt to be made too much. This is fully evinced by the great inconveniencies that are frequently ſuſtained from the heating of the ſtacks in the former caſes, while in the latter it is but ſeldom heard of.

It has been ſuggeſted by an accurate obſerver, that in the making of hay "ſome attention ſhould be paid to the quality of the ſoil and the kind of herbage growing upon it. The hard benty hay of a poor ſoil is in little or no danger of heating too much in the ſtack; it ſhould, therefore, be put very early together, in order to promote a conſiderable ſweating, as the only means of imparting a flavour to it, which will make it agreeable to horſes and lean cattle, as it will be nearly unfit for every other ſort of ſtock. It is the ſucculent herbage of rich land, or land highly manured, that is moſt likely to generate too great a degree of heat; of courſe graſs from ſuch land ſhould have more time allowed in making it into hay. In moderately hot ſeaſons the proper point of drying may be eaſily judged of; but when

they are very hot and ſcorching it is eaſy to be miſtaken; as in ſuch weather the graſs becomes criſp, ruſtles, and handles like hay, before the moiſture or ſap is ſufficiently diſſipated for it to be in a ſtate fit to be laid up in large ſtacks. If that, however, be done when it is thus inſufficiently made, it moſtly heats too much, becoming mow-burnt in ſome caſes*."

There is another circumſtance, which though difficult in many caſes to be performed, is of much conſequence; this is that of "carrying the whole of the hay juſt at the moment it is ſufficiently made; which is neceſſary in order to its yielding the greateſt poſſible weight, and preſerving its beſt quality; as every minute after that preciſe time it continues to loſe, both in weight and in its nutritious properties, by evaporation," as is evinced by the ſmell. "Even the difference of an hour, in a very hot drying day, is ſuppoſed to occaſion a loſs of 15 or 20 per cent. on the hay, by its being carried beyond the point of perfection, and frequently even a greater loſs is ſuſtained†."

The art of hay-making has been obſerved to have been brought to a degree of perfection in this diſtrict altogether unequalled by any other part of the kingdom. The neat huſbandry and ſuperior ſkill and management, ſo much and juſtly admired in the arable farmers of the beſt cultivated diſtricts, may, with equal juſtice and propriety, be ſaid to belong in a very eminent degree to the hay-farmers of this part of the iſland, as they may very fairly claim the merit of having reduced the art of making good hay to a regular ſyſtem; which, after having ſtood the teſt of long practice and experience, is found to be attended with the moſt perfect ſucceſs. Even in the moſt unfavourable ſeaſons the hay made according to this method is ſuperior to that made by any other under ſimilar circumſtances. It is, therefore, to be regretted that this very excellent practice has not yet, except in a very few inſtances, travelled beyond the limits of the county. But as it highly deſerves the attention and imitation of farmers in other diſtricts, we ſhall deſcribe the whole process, from the moment at which the mower applies his ſcythe, to that in which the hay is ſecured in the barn or ſtack‡.

The chief part of this ſort of labour is performed by means of ſmall forks made for the purpoſe.

In the firſt day's proceſs all the graſs mown before nine o'clock in the morning is tedded or ſpread out, great care being taken to ſhake it ſo as to leave it free from lumps, and to ſtrew it evenly over the whole ſurface of the ground. It is ſoon afterwards turned, with an equal degree of care and attention; and if the number of

* Middleſex Report. † Ibid. ‡ Middleton's Report of Middleſex.

hands be ſufficient they turn the whole again, or at leaſt as much of it as they can before twelve or one o'clock. It is then raked into what are termed ſingle windrows, or ſo as that each perſon may form a row at about three feet diſtance; and the laſt operation of the day is to put it up into graſs-cocks. The buſineſs of the ſucceeding day commences with the proceſs of tedding all the graſs that was mown the firſt day after nine o'clock and all that was mown this day before the ſame hour. The graſs-cocks are then well ſhaken out into what are called ſtaddles, which are ſeparate plats of five or ſix yards in breadth. Where the crop is ſo thin and light as to leave the ſpaces between the ſtaddles rather large, they are immediately raked clean, and the rakings mixed with the other hay, in order to its all drying ſo as to be of an uniform colour. The ſtaddles are next turned, and after that the graſs that was tedded in the firſt part of the morning once or twice, in the ſame manner as deſcribed in the firſt day. This buſineſs ſhould all be performed before twelve or one o'clock, that the whole may lie to dry while the people are at dinner. After this the firſt thing is to rake the ſtaddles into double windrows, which is done by every two perſons raking the hay in oppoſite directions or towards each other, forming a row between them of double the ſize of the ſingle windrows, each being about ſix or eight feet diſtant from the other. They afterwards rake the graſs into ſingle windrows; then put the double windrows into baſtard cocks; and conclude by putting the ſingle windrows into graſs-cocks. The labour of the third day is begun by firſt tedding and ſpreading out the graſs mown and not ſpread the preceding day, as well as that mown in the early part of this day, and then the grass-cocks are thrown out into ſtaddles as before, and the baſtard cocks into ſtaddles of leſs extent. Theſe narrow ſtaddles, though laſt ſpread out are firſt turned, then thoſe which were in graſs-cocks, and laſtly the graſs is turned once or twice before twelve or one o'clock. When the weather has been ſunny and fine, the hay which was laſt night in baſtard cocks will this afternoon be in a proper ſtate to be carried, as in fine ſeaſons it may moſtly be performed on the third day; but when the weather has been cool and cloudy, no part of it probably will be fit to carry. In that caſe, the firſt buſineſs after dinner is to rake that which was in graſs-cocks laſt night into double windrows; then the graſs which was this morning ſpread from the ſwaths into ſingle windrows. After this the hay which was laſt night in baſtard cocks is made up into full ſized cocks, and care taken to rake the hay up clean, and alſo to put the rakings upon the top of each cock. And laſtly, the double windrows are put up into baſtard cocks and the ſingle ones into graſs-cocks, as in the preceding days. On the fourth day the great cocks juſt deſcribed are moſtly carried before dinner. The other ope-

rations are ſimilar to thoſe of the former days, and proceed in the ſame order, continuing them daily until the whole is finiſhed.

During the whole courſe of hay-making the graſs ſhould, as much as poſſible, be protected both in the day and night againſt rain and dew by cocking *.

In diſtricts where the hay ſeaſon is later and the weather more changeable, it would often be dangerous to expoſe the hay ſo much abroad as in the above proceſs: a more cautious method ſhould probably be adopted. In ſuch caſes, inſtead of keeping the hay almoſt conſtantly ſpread out and expoſed to the atmoſphere, as in the preceding method, it may be better to put it into ſmall cocks ſoon after it has been cut down and become a little made; theſe ſhould then be frequently turned over but not ſpread out, except when the weather is in ſuch a fine ſtate as to inſure their being put up again in the ſame ſtate, without injury from the falling of rain †. This method is much more ſlow, though the hay is leſs expoſed to danger in wet weather, than in that which has been deſcribed above; and when there is much heat it may be made with little trouble or expenſe, and without much expenditure of its nutritious juices.

Another practice that has been found uſeful in ſuch ſituations is, to break out the graſs that is mown, turn and windrow it the firſt fine day, and alſo to put it into ſmall cocks when the ground is dry; on the next fine day a few of the cocks are broken out at a time, and kept conſtantly turned till fully dry. Three or four of them are then put into one cock, the work proceeding in the ſame manner till the whole is done. And when the weather is bad theſe cocks are never re-broken out, being only lightened up to let the air paſs through them more freely.

The advantages in the firſt mode are ſuppoſed by ſome to be, that from the regular tedding that is given the hay becomes of a more valuable quality, heats in the ſtack or mow in a more uniform and equal manner, and cuts out better in the truſs.

It is likewiſe well obſerved, that no more of the produce ſhould be thrown abroad than can be put up into cock the ſame day, or before it is injured by the fall of rain. When the weather is unſettled, it may often be permitted to remain in the ſwath for ſeveral days, only taking care that the underſides do not become diſcoloured by turning them over by the head of the rake. In this way it will frequently be ſo much made, in a few days, as to require little tedding afterwards to form good hay ‡.

* Corrected Report of Middleſex. † Modern Agriculture, Vol. II. ‡ Middleſex Report.

The preſerving hay of a proper green colour is a circumſtance of ſome importance. In order to effect it the baſtard cock, previous to their being carried, ſhould be put up in the heat of the day and remain in that condition till the following morning, when they muſt be turned and opened ſo as to diſpel any damp that might induce it to heat in the ſtack, and in that way ſpoil the colour*. The acquiſition of a lightiſh brown colour in the ſtack is not found injurious to hay, but where it becomes of a *dark* brown from too much heat, it is ſaid to weaken and relax horſes that are fed upon it by its powerful diuretic quality. It is of courſe of inferior value.

The *rowen*, or ſecond crops of hay, from their being ſlender, having fewer ſucculent ſtems, in moſt caſes require leſs time in being made into hay than the firſt. In ſecuring this ſort of hay it is, however, advantageous to have it well made, as without this it will be very liable to grow mouldy in the ſtack and become of a bad colour from taking on too great a degree of heat, as the leſs it heats in the ſtack the more green the colour will be.

Stacking and Thatching Hay.—In performing this buſineſs it is always adviſable to have ſtaddles made for the purpoſe, ſomewhat in the ſame manner as thoſe that have been recommended for grain, though it is too common a practice to build hay-ſtacks without ever attending to this circumſtance. They need not, however, for this uſe be raiſed ſo high or have any ſhelving outwards, but be quite plumb and without copings. In the common method of placing them upon the ground, on a little drift, or a few pieces of wood laid acroſs each other, there muſt conſtantly be great loſs in the bottom parts of the ſtacks from the moiſture being abſorbed by the hay; but by the uſe of ſtaddles this may be wholly avoided, and the expenſe will be but a trifle, as any old rough pieces of wood will anſwer the purpoſe.

In reſpect to the form of the ſtack it is not a matter of much conſequence, the long ſquare, or oblong ſhapes are the moſt ſafe and convenient, eſpecially when not too broad, as they admit the air the moſt fully. Beſides, they are the moſt convenient to cut from in truſſing hay for ſale. But the circular form for farm uſe, where ſtraw is ſcarce, may be the moſt advantageous in the economy of ſtraw in thatching.

The ſize of the ſtaddle or ſtack bottom ſhould be proportioned to the quantity of hay, but it is better not to have the ſtacks too large; twenty-four feet by fourteen or fifteen is for moſt occaſions a good ſize.

The buſineſs of ſtacking hay is beſt performed, if poſſible, while there is a full

* Middleſex Report.

ſun, eſpecially when the ſeaſon is indifferent, as by that means it is much improved. It is neceſſary to have a perſon that underſtands the art of ſetting up ſtacks, and a ſufficient number of helpers to aſſiſt in ſpreading the hay and treading it well down. In building, the middle of the ſtack ſhould always be well kept up, ſomething higher than the ſides. In this diſtrict, where work of this ſort is well executed; at leizure times, during the whole period the ſtack is building, the men are employed in pulling the ſides and ends into proper form. And it is common to have a large ſail cloth raiſed on poles, which covers the whole and prevents its being injured by rains until it is finiſhed.

In order to prevent the hay-ſtacks from heating too much, holes, pipes, chimneys, and other contrivances are ſometimes formed in the middle of large ſtacks to draw and conduct off any ſuperabundant heat. It is better, however, to avoid theſe as much as poſſible, as the hay round them is always much injured by attracting the moiſture of the ſtack.

In building the upper parts of ſtacks of hay, corn, or other materials of a ſimilar nature, ſome contrivance of the *ſtacking ſtage* kind is neceſſary, in order to enable workmen to pitch the ſubſtances with convenience to the perſon who ſtacks them. The common method of performing this is by means of a framed ſtage, ſet upright, ſufficiently near the ſtack to ſuit the workman who pitches the hay or grain to it. But a ſtage of this ſort which appears to be better contrived, and which is more ſimple and cheap, is deſcribed by Mr. Young in his excellent Report of the Agriculture of the County of Suffolk. It is ſuggeſted that this ſtage may alſo be employed for nailing up weather-boarding, painting the outſides of buildings, plaſtering of walls, and ſeveral other purpoſes of the ſame kind.

After the work of ſtacking has been completed, and the ſtack is pulled and topped up, it is left till it has ſweated and is perfectly ſettled, which is moſtly the caſe in a week or ten days: the roof ſhould then be well covered by a good coat of thatch, ſecured by means of a ſtraw rope, extended along the eves acroſs the ends and on either ſide juſt below the ridge. This rope is uſually ſecured by means of pegs. The roof ſhould be dry when the thatch is put on to prevent the hay from becoming mouldy. It is of great conſequence that this ſort of work be well performed, the farmer ſhould of courſe always have attention to it, as labourers are often apt to ſlight it.

It is a point not perfectly decided among agricultors, whether hay keeps better in ſtacks in the open air or in barns for the purpoſe. It is the opinion of moſt farmers in the ſouthern diſtricts of the kingdom, that the firſt mode has the advantage in ſo far as reſpects the quality of the hay.

In many of the more northern parts of the iſland the hay is, however, ſecured in

the barn, and has appeared, in all the examinations we have made, equally good and ſweet with ſuch as has been preſerved in ſtacks in the open air. And the trials of Mr. Middleton, as ſtated in the Middleſex Report, ſeems to ſupport the ſame ſuppoſition; as in ſecuring hay in his barn, without clearing it from the quartering on the ſides, he found on cutting and binding it up, that it was equally good in quality with that from the ſtack-yard, and as perfectly free from duſt. The hay was made without rain, and that which was the leaſt made put in the barn.

Barns are obſerved to have other advantages, being "extremely uſeful and convenient during a catching and unſettled hay-harveſt, and alſo at other ſeaſons of the year. In wet and windy weather they afford an opportunity of cutting, weighing, and binding hay; none of which operations could at ſuch a time be performed out of doors." All the farmers who were conſulted on the ſubject "agreed, that hay might be put together earlier, even by a day, in a barn than it would be ſafe to do it in a ſtack."

In anſwer to objections made on the grounds of the practice not repaying the expenſe of large barns, it is remarked, by the ſame writer, that it is "in direct oppoſition to the opinions of the beſt hay-farmers in the country, and contrary to his own experience. For in the drieſt ſeaſons barns are a ſaving of four or five ſhillings an acre; and, in wet ſeaſons, the ready aſſiſtance which they afford in ſpeedily ſecuring the hay, has been known to make a difference in price of twenty ſhillings per load on a ſmall number of loads."

There are other advantages in the uſe of barns for this purpoſe, as there is not only leſs litter and waſte, but, in merely hay diſtricts, a great ſaving in ſtraw, which is now an expenſive article in many places, eſpecially near large towns.

But without having recourſe to the erection of expenſive barns, many of the conveniences and advantages of them, eſpecially thoſe of ſaving the labour and expenſes of thatching, may be obtained by the uſe of covered ſheds, raiſed on pillars or poſts, and open on all the ſides. Theſe may be conſtructed in a cheap manner by having the roofs made with thin feather-edged boards, well payed over on the outſide with tar or paint. Theſe are light, cheap, and will laſt a great length of time by care in keeping them well painted*.

* The expenſes of mowing and making the hay in the firſt method, carrying, ſtacking, thatching, and other neceſſary operations, are thus ſtated by the author of the Report of Middleſex:

Expenſes per Acre.	£.	s.	d.
Mowing 3s.—beer 6d.	0	3	6
Making and ſtacking	0	9	6
Pulling the ſtack, and laying the hay pulled out upon the ſtack	0	0	6
Horſes, harneſs, and carts	0	2	0
Straw for thatch 3s. thatcher and labourer 6d.	0	3	6
Total expenſe per acre in the ſtack-yard is 19 or 20s.			

On ſome hay-farms the dependence is chiefly upon the ſale of the article, which is conveyed to the market after being cut by a knife, and bound up into truſſes, weighing fifty-ſix pounds each, thirty-ſix of which form a load, or about eighteen hundred weight; but when ſold freſh from the field, twenty hundred weight conſtitutes the load*. When the hay has been preſerved in a perfectly good condition, there ſhould not be the ſmalleſt waſte in the binding; the looſe parts being put in the middle of the truſſes and the bands twiſted from the long coarſe parts.

The quantity of produce obtained from an acre of graſs land muſt be different according to the fertility, management, ſeaſon, and other circumſtances; but from one to two loads is the uſual proportion.

For the purpoſe of facilitating the buſineſs of getting the hay together in bad ſhowery ſeaſons, *hay-ſweeps* and *ſledges* have been conſtructed.

A contrivance of the firſt ſort has been invented by Mr. Middleton, which ſeems to be poſſeſſed of merit. It is ſo conſtructed as to be drawn by four horſes in pairs, but ſmaller ones might be made to be drawn by two, and is managed by two boys, one of whom drives each pair of horſes, being mounted on one of them. Where the ground is level, little more will be neceſſary in order to aſſiſt the machine than merely to break and turn up the rows of hay in different places; but where the ridges are high, and there are conſiderable inequalities of ſurface, it will be requiſite to aſſiſt the implement by occaſionally ſticking the prongs of a fork into the ſtill hay juſt before the machine, that it may more effectually catch it.

In Yorkſhire another ſort of contrivance, termed a *hay-ſledge*, is employed for the ſame purpoſe, and in ſome ſituations is probably to be preferred; as where the land is dry, the ridges high, and the ground irregular in the ſurface. With this machine and two horſes the hay may be collected together, loaded, and carried to the ſtacking place, in much leſs time than by means of a cart. In loading it, the hay is firſt to be raked into rows, when the ſledge is brought to the end of one of them, and one of the horſes made to paſs on each ſide, until it has collected a ſufficient quantity for a load, one of them then croſſing the row of hay, the load is conveyed to the ſtack; when, by the horſes being turned about, the ſledge is drawn back, leaving its load behind it.

Since the period this ſtatement was made, 1798, the expenſes have increaſed very conſiderably.

It is added that "If the hay be put into barns, the laſt charge of 3s. 6d. will not, of courſe, be incurred; moſt of the third, and part of the ſecond, will alſo be ſaved; ſo that the whole expenſe in this caſe will not exceed 15s. per acre."

* Synopſis of Huſbandry.

The moſt economical and advantageous methods of conſuming this ſort of fodder will be conſidered when we come to ſpeak of the different modes of managing live ſtock.

After-Graſs, or Rowen.—In ſome diſtricts much of the after-graſs is frequently cut and made into a green ſoft ſort of hay, in the manner that has been already mentioned; but in others it is fed off by live ſtock in the autumn. Both modes may be uſeful under different circumſtances. In ſituations where plenty of manure can be procured, as near large towns; and where the chief dependence is upon the ſale of hay, or where lamb ſuckling prevails, it may frequently be a beneficial practice to take a ſecond crop of hay, as the firſt may by that means be more fully ſpared for ſale, the after-crop ſupplying the cows or other cattle that may be kept on the farm. But in caſes where manure cannot be eaſily obtained, and there is no local practice carried on that particularly requires ſuch ſort of hay, it is better to let it be fed off by ſtock than run the riſk of exhauſting and injuring the ground by the taking off repeated crops. There is alſo another circumſtance to be conſidered in this buſineſs, which is that of the ſtate of the land in reſpect to dryneſs; as where it is low, wet, and very retentive of moiſture, it may be often more hurt by the poaching of the cattle in feeding off the herbage than by taking a ſecond crop of hay.

Independently of theſe conſiderations, it may, however, in general be a more ſafe and uſeful practice to eat off the after-graſs by ſtock, and only take one crop of hay, as by ſuch means a more abundant annual produce may be afforded and the land ſuſtain leſs injury*.

Where a crop of rowen is made into hay, the moſt profitable application of it is probably in the ſoddering of ſuch cows as are in milk, as it is well ſuited, by its graſſy quality, and its not heating ſo much when well made as other ſorts of hay in the ſtack, to afford a large flow of milk. It is this reaſon that induces the cow-farmers to cut their graſs ſo many times in the ſummer. Another beneficial application of this hay is in the feeding of ſuch ewes as are employed in the ſuckling of houſe-lambs during the winter ſeaſon; the intention in this caſe is the ſame as in that of the preceding inſtance. There is another advantageous uſe to which this ſort of produce may be applied, which is that of ſupporting young calves and all ſorts of young cattle that are kept as ſtore ſtock.

Where ſheep require the ſupport of hay in the winter ſeaſon, it is alſo well adapted to that uſe.

* Corrected Agricultural Report of Middleſex.

Where after-graſs is fed off by ſtock, there is much difference of opinion in regard to the moſt proper periods of turning in the animals. Some have contended that it is the beſt practice to let them into the field before the young graſs has attained any very great head; while others maintain the oppoſite doctrine, and think it the beſt method to allow the graſs to get up to a full bite before the ſtock is turned upon the land. Both endeavour to ſupport their opinions by experience. But as they cannot be both of them true, it is probable that the extremes of each are to be avoided; and that, as in many other matters, the truth may lie in the middle. This is indeed equally ſupported by fact and the obſervation of the moſt intelligent managers; as when the cattle are turned in too early there is not a ſufficient bite to keep up the condition of the animals; while in the contrary extreme, the ſtock ſo ſoon fill themſelves that much of it is trodden down and waſted afterwards in their roaming about the fields to pick the ſweeteſt morſels. In confirmation of this opinion, Mr. Marſhall found in the midland diſtricts that milch cows fell off in milk, and bullocks in fleſh, on being put in too early, before there was a ſufficient bite. This he, however, ſeems to conſider as ariſing from the want of nutritious quality in the graſs in this ſtate. And the incautious obſervation of common farmers has aſcribed it to the inconvenience the animals ſuſtain in feeding from the ſtubs. It is not, however, probable that either is the caſe; for as ſoon as the ſcythe has ſeparated the old graſs from the roots, new ſhoots are made that are highly ſweet and nouriſhing. This may be eaſily perceived to be the caſe on examining a piece of ground ſoon after its being mown, and taſting the young ſhoots. The ſuppoſition reſpecting the ſtubs is ſhown to be founded in error, from the circumſtance of the ſtock devouring the herbage with avidity, as Mr. Marſhall has well remarked. Beſides, the animals lick in their food by the tongue, which is armed for the purpoſe before it is bitten, and do not puſh their noſes ſo as to be inconvenienced by the ſtiffneſs of the cut graſs-ſtems. It is poſſible, however, that ſome effect in lowering the condition of the ſtock may ariſe from the laxative effect that may at firſt be produced on the animals by ſuch young ſucculent graſs.

Where much ſtock is turned upon after-graſs in a full ſtate of growth, there cannot be any doubt but that much loſs muſt, as has been juſt obſerved, be ſuſtained by the treading down and rendering the graſs unfit for being eaten off. This is ſufficiently evident on viewing fields fed in this ſtate.

It is therefore perhaps only by beginning the paſturage of after-graſs when in the middle ſtate of growth that it can be conſumed to the beſt advantage, and without loſs in either of the ways that have been juſt noticed. This practice ſeems to be

countenanced by the obſervation of an agricultor who has had much opportunity of information on the ſubject*.

The manner of feeding down after-graſs varies much in different diſtricts; it has been obſerved by a farmer in Middleſex, that the condition on which he rents his farm is that of taking out the heavy cattle at Michaelmas, but that ſheep remain till February: in this county the practice is to turn on the cattle immediately after mowing. But in the northern diſtricts this graſs, to which they have given the name of eddiſh, is kept till November or even a later period for the purpoſe of finiſhing fat ſtock, or for the paſturage of milch cows, from which a ſuperior quality of cheeſe is made, and by which time it has attained a conſiderable head: however, this latter practice would ſeem to be attended with ſome loſs, from its being trodden and trampled under foot as may be readily perceived by examining the field.

In the ſtocking of after-graſs, ſome attention is neceſſary not to have too great a number of animals on a given proportion of land.—To overſtock produces injury in various ways, eſpecially on firſt turning in, but particularly by too much treading and beating down the graſs. Mr. Marſhall found the midland graziers of opinion, that one cow to the acre on well grown after-graſs was an ample ſtock. Good graſs-land may, however, admit ſomething more.

In the paſturing of rowen, or after-graſs, by heavy cattle in the autumn, great injury has been complained of from their poaching the ground, particularly at a late period in that or the winter ſeaſon. On this account it has been recommended to confine the conſumption of this graſs principally to the ſupport of ſheep, unleſs in very favourable ſeaſons, or where the ſoil is uncommonly dry, in which caſes milch cows or other heavy cattle may be admitted without inconvenience†.

It is the practice in caſes where there is a great ſcarcity of ſpring feed to reſerve after-graſs in the autumn for ſpring uſe. Some on the baſis of experience contend that it is the moſt certain, and, on the whole, the beſt ſpring feed yet known. This would ſeem however to be a waſteful practice, at leaſt in reſpect to the more forward after-graſſes. The forwardeſt ought certainly to be eaten without waſte, before winter ſets in; and the lateſt, that is to ſay the ſhorteſt, may be ſhut up for ſpring feed. If after-graſs be too long and groſs, it is apt to lodge and rot upon the ground in winter; therefore on rich lands, it ſhould always be more or leſs fed off before Michaelmas, in order to prevent its being waſted or loſt in the winter. An expe-

* Marſhall's Rural Economy of the Midland Counties.

† Wilkinſon in Commercial and Agricultural Magazine, Vol. IV.

rienced agricultor found, from repeated experiments, that old after-graſs ſeeds ſheep that give milk better than turnips, which are more adapted to the fattening of ſtock; and that this graſs holds to a period, if wanted, when moſt other reſources fail, the laſt half of April, and the firſt half of May—periods always of want and difficulty, where rye graſs is not ſown*. Mr. Marſhall alſo aſſures us, that as a certain and wholeſome ſupply of food for ewes and lambs in the early ſpring, the preſerved paſture is to be depended upon as "the ſheet-anchor", in preference to turnips, cabbages, or any other ſpecies whatever of what is termed ſpring feed.

The ſame thing has been experienced by Dr. Wilkinſon, who has obſerved that this food with him afforded a more nutritive and healthful quality of milk from the ewes to their tender lambs than turnips, even in their beſt ſtate.

But however uſeful after-graſs paſtures may be under this management, there is evidently a great loſs of food incurred by it, eſpecially in ſevere winters: it would therefore ſeem to be frequently the beſt practice to eat after-graſs well down, as late as poſſible in the autumn, by differerent ſorts of live ſtock, and depend in a great meaſure upon the new graſs for ſpring feed.

It has been ſuggeſted that mowing the preſerved after-graſs in the winter, and giving it to the ſtock in the farm-yard, might be advantageous in preventing the land from being poached, and the uſeful long graſs from being trampled down and deſtroyed †. The trouble and expenſe of the proceſs would perhaps in general be too great, though in particular circumſtances, as where other ſorts of fodder do not bear a proportion to the quantity of ſtock to be kept, and where ſheep are conceived improper, it may afford ſome convenience and benefit, eſpecially where it can be performed without injury to the ground by poaching, in the conveying away the materials which can ſeldom be the caſe except where the land is very dry; in which ſituations there is rarely much after-graſs for this purpoſe.

Where the nature of the ſoils is ſuch as not to admit heavy cattle, early and late lamb-ſuckling may often be carried on with advantage, as well as the feeding and fattening of other ſorts of ſheep, which is frequently the caſe in this diſtrict.

Paſture Lands.—Having in the preceding pages explained the different methods of management that ſeem neceſſary in the cultivation of thoſe ſorts of graſs lands that are chiefly applied to the purpoſe of producing hay, we ſhall now deſcribe the modes of practice which appear requiſite in ſuch as are almoſt wholly appropriated to the ſupport and fattening of live ſtock.

The grounds that are the moſt perfectly adapted to this uſe are, all thoſe which have a conſiderable depth of good mould, and at the ſame time that they afford a

* Young in Annals of Agriculture. † Lawrence in Commercial and Agricultural Mag. in Vol. IV.

good herbage are ſo dry in their nature as to admit the animals to feed upon them at almoſt all ſeaſons without injury by poaching. Coarſe ruſhy lands may, however, in many caſes be converted into good paſtures, by proper attention in draining, and cutting over the ruſhes in the early part of the ſpring, as by this means the water enters their ſtems and the plants decay, the young ſhoots being afterwards eaten by young ſtock, and the good graſs plants allowed to flouriſh. There is alſo another ſort of land that may be employed in this way, which is that of the moory kind, conſiſting of much imperfectly reduced vegetable matter proceeding from the leaves and roots of various decayed vegetable productions, that require to be brought into a ſuitable condition for the ſupport of graſs plants by proper drainage and the application of ſubſtances of the foſſil kind.

Paſture lands ſhould likewiſe, as much as poſſible, poſſeſs properties in the nature of their graſſes that are the moſt advantageous for the particular method of management under which they are to be conducted. In this view, ſome may be more adapted to the producing of milk or butter, others of cheeſe, and others again of feeding or fattening animals. It is in ſome meaſure on this account, as well as that of local convenience, that different modes of management are employed on graſs lands.

The difference of ſituation in paſture lands has likewiſe much influence in directing the uſes to which they may be applied with the greateſt benefit. The higher or more elevated grounds being in general more proper for ſheep, while thoſe of the lower and more incloſed kinds are moſtly better ſuited for the purpoſe of neat cattle or other animals under the fattening ſyſtem. And beſides, the age of the lay makes a difference in ſome caſes; new laid down paſture lands being commonly found more proper for the ſupport of the young ſtore animals, while thoſe that have been long in the ſtate of ſward are in general better adapted to the feeding or fattening ſtock.

The mode of incloſing has alſo ſome effect in the ſame way; as when the incloſures are of a moderate ſize, they are found more ſuitable for the purpoſes of feeding than where the contrary is the caſe*.

This ſort of graſs land, as well as that of the hay kind, is ſubject to be overrun and much injured in its produce both by moſs, coarſe plants, and ant- as well as mole-hills. Theſe ſhould therefore be conſtantly removed, or ſpread about as ſoon as poſſible, and prevented from obſtructing the complete paſturage of the lands in the manner that has been recommended above.

On the marſh grazing lands in Kent, where ant-hills frequently occur, they have a mode of extirpating them in an eaſy and expeditious way, and of bringing the ſurface level, which is by the uſe of an implement, eight or nine feet in breadth,

* Corrected Report of Perthſhire.

which is armed with a ſort of ſtrong cutting blade. When in uſe, it is drawn by a horſe directed by a boy, and guided behind by a man, and is capable of often cutting off ſeveral of the hills at one ſtroke, and of courſe of clearing a number of acres in a very ſhort ſpace of time. There are various other ploughs in uſe for this ſort of work.

But, beſides theſe, paſtures when not well attended to are frequently prevented from being properly fed, by various kinds of low ſhrubby plants, ſuch as thoſe of the alder, brier, broom, furze, and other ſorts that ſhoot out upon the ſurface, and which ſhould always be extirpated as ſoon as the buſineſs can be conveniently done; as by their remaining upon and ſhading the ground they render the herbage ſour and improper for the food of cattle. This ſort of work may be performed by cutting them cloſely down as they riſe in the early ſpring months; but a better practice is to dig them or plough them completely out, in the manner that has been deſcribed in ſpeaking of the methods of bringing lands into the ſtate of cultivation*. The ſhrubby, black, and other thorns and briers that ſpring up from ſuckers on the ſides of the hedge-rows of paſture grounds, ſhould likewiſe be exterminated, eſpecially where ſheep are paſtured, as they do great miſchief by pulling and entangling their coats. Beſides, much ground is often loſt in this way, and the appearance of the hedges is diſguſting. In many caſes after the plants are ſtocked up, the earth about them might be thrown up into a compoſt with a ſmall proportion of well rotted dung, and ſpread upon the land with much benefit; and at the ſame time the land thus cleared be brought into a proper condition for being ſown down with graſs ſeeds.

Where paſtures are productive in graſſes of the more ſharp coarſe bladed kinds which riſe into tufts or tuſſocks, and which are known to agricultors under the titles of pink or carnation graſſes, and there are other ſorts of aquatic plants preſenting themſelves, it is a certain indication that the ſoil is too retentive of moiſture, and not only ſtands in need of draining, but alſo of being kept in a cloſe ſtate of feeding by different ſorts of ſtock.

The manuring of paſture lands is a buſineſs much leſs in practice than ought, perhaps, to be the caſe, as where the ſoil is not good, and they are kept in a conſtant ſtate of feeding or paſturage, it would ſeem probable that their fertility muſt in ſome meaſure decline, if proper means be not taken to preſerve and keep it up, even though they ſhould be fed down with ſheep, which is unqueſtionably in this view the moſt favourable ſort of ſtock. It is indeed hardly to be ſuppoſed that the ſmall proportion of excrementitious matter that is dropped at random during the feeding of the animals, eſpecially the larger kinds, under an expoſure to the diſſipating and waſhing effects of the atmoſphere, at different ſeaſons, where no other ſorts of food

* Section on the Cultivation of Arable Land.

than that of the natural graſs of the paſtures is conſumed, can in ſuch ſorts of land be adequate to the reſtoration of the great degree of fertility that is conſtantly conveyed away in the time of paſturing. In the better kinds of paſture lands, where the produce of graſs is conſiderable, improvement may, and undoubtedly does, take place by feeding them, eſpecially by ſheep, as the diſcharges of the animals are not only more abundant, but a proportion of old graſs is left to decay during the winter ſeaſon, and in that way make an annual addition to their fertility. It appears probable to me, however, it may differ from opinions that have been held on this ſubject by ſome cultivators, from much cloſe attention to the management of graſs lands of the leſs rich kinds in the ſtate of paſture, that in ſuch caſes, unleſs attention be paid to improve their condition by ſome other means than merely that of the manure diſperſed over the land by the animals in ſimply conſuming the herbage, that they muſt in time become gradually deteriorated, and the quantity of paſturage be leſſened ſo as to ſupport ſmaller proportions of ſtock than was formerly the caſe. This ſuppoſition ſeems indeed, in ſome degree, ſupported by the condition of downs, and other uninclоſed lands that have been in a ſtate of paſturage for a great length of time; as in theſe caſes, if feeding had rendered them more fertile, they muſt long ſince have been enabled to carry a vaſtly increaſed proportion of ſtock; which is certainly not the caſe*.

That feeding down paſture lands, of theſe as well as other kinds, in a judicious manner has the effect of rendering the herbage more fine, and better for the ſupport of ſtock in general, there cannot be the ſmalleſt doubt; but it does not certainly follow that the fertility of the land, in ſuch caſes as have been juſt mentioned, is thereby really improved, as has been ſuppoſed by ſome employed in the buſineſs of grazing in particular ſituations and circumſtances. Where the paſtures, as has been juſt obſerved, are in ſuch heart as to afford a large quantity of herbage for being converted into manure, and ſufficient to permit a portion annually to revert to the ſtate of vegetable mould by its undergoing the proceſs of putrefaction, a conſiderable progreſſive improvement muſt, without doubt, be the caſe under the paſturing ſyſtem, eſpecially where ſheep conſtitute the principal ſtock. And in moſt caſes the fining of the herbage by this practice muſt be advantageous. It ſeems, therefore, not improbable but that the bettering of the condition of the herbage by feeding the lands with ſheep may have occaſionally led to the ſuppoſition that the fertility of the grounds was thereby, in *all* caſes, really improved. That an increaſe of fertility is produced, in moſt inſtances, by the paſturing of lands with ſheep, is not diſputed; it is only in particular circumſtances that the contrary is contended to take place. And in all caſes the injury that may be

* Anderſon's Eſſays, Vol. III.

ſuſtained in this way muſt evidently be very ſmall, when compared with that which takes place from repeated mowing without the application of ſuitable dreſſings to the lands.

The improvement of the fertility of paſture grounds may be effected in different ways, as either by the direct application of manure in its natural ſtate, ſuch as that of rotten dung, lime, marl, or in that of earthy compoſt, occaſionally over their ſurfaces in a thin even manner; or indirectly by the folding or confining of ſheep upon the land during the time they conſume other ſorts of green food, ſuch as turnips, &c. The latter mode is unqueſtionably the moſt advantageous and convenient, as it is in but very few ſituations that the former can be practiſed without injury to the arable or hay lands. By proper attention in this way the more poor paſture grounds might ſoon, and at little expenſe, be brought into a good ſtate of paſturage; which could ſeldom or ever be the caſe without it.

The moſt proper period for turning the ſtock into the paſtures in the ſpring ſeaſon has been a matter of diſpute among thoſe employed in the management of graſs lands; ſome contending that it ſhould be done early, before the natural graſs has riſen to too great a bite, while others maintain the contrary opinion. There are probably inconveniences attending each of theſe extremes, as in the firſt the ſtock, eſpecially when of the fattening kind, may ſuſtain injury from the want of a ſufficient bite to permit the animals to fill themſelves in an expeditious manner; and in the latter there may not only be much waſte by the ſtock not being capable of keeping it under, but great loſs and inconvenience from its running up in tufts to ſeed, and by that means rendering the paſtures patchy and unevenly fed down, by which the extent of real paſturage is leſſened. It has been alſo obſerved, that by turning the ſtock upon the paſtures when there is a full bite the better ſorts of graſſes are only conſumed, the more coarſe herbage being rejected and let run up to ſeed, by which the lands are greatly injured at the time as well as in future; while, on the contrary, if the ſtock be allowed to enter during the time ſuch coarſe plants are in their more tender early growth, and before the paſture is covered with better herbage, the whole of the other plants will be fed down in a regular manner with the graſs*. It is likewiſe remarked by the ſame writer, that the want of a full bite on the firſt turning out of ſtore ſtock is of advantage to the animals, as they become more gradually accuſtomed to the change from dry food to ſucculent herbage. And it is ſuppoſed that fattening ſtock only require a full bite on being at firſt put upon the paſture†. In anſwer to the objection that has

* Marſhall's Rural Economy of Yorkſhire. † Ibid.

been made, that early turning upon paſtures expoſes them more to the effects of drought in the ſpring months, it is ſaid that it is in a great meaſure ill founded, ſince cattle milk and thrive well in ſuch caſes. "It is not," Mr. Marſhall remarks, "the length of graſs, but the quantity of nouriſhment which it contains, that makes cattle pay for their paſturage." And it is not ſuppoſed improbable but that the richneſs of the herbage may in ſome degree depend on the ſun or heat of the ſeaſon*.

As the ſtate of graſs which is the moſt favourable to the feeding of the ſtock, and their expeditious filling themſelves and taking their reſt, as well as that of their waſting the leaſt poſſible proportion of the food, would ſeem to be that of a middle degree of growth, it is not improbable but that that may be the moſt proper and advantageous period for breaking the paſtures; the exact time of which muſt obviouſly be regulated by the nature of the ſoil, the ſituation of the land, and the ſtate of the ſeaſon. From the end of March to the latter end of April, or beginning of the following month, according to the forwardneſs of the ſeaſon, may be the moſt advantageous in the ſouthern diſtricts, but in thoſe of the north it may be deferred a week longer or more with benefit.

In regard to the general eating down of paſture lands there is likewiſe much difference of opinion, ſome adviſing that it ſhould be done in as cloſe a manner as poſſible, others that this ſhould never be the caſe. It would ſeem, however, that the cloſeneſs or degree of feeding that is the moſt proper ſhould be directed by the nature of the graſs and the time at which it is performed, as where the herbage is of the coarſer kind and conſumed in the autumnal ſeaſon, it may be done much more cloſely than in the contrary circumſtances, as ſuch ſorts of graſs muſt always be improved by ſuch cloſe feeding, and no injury can be ſuſtained at ſuch ſeaſons from the roots of the graſſes being left ſo much expoſed, which would be the caſe in the later ſpring or early ſummer months, from the conſtantly increaſing heat at ſuch periods.

The advice that has been given by an intelligent obſerver on this ſubject may in general be adopted with propriety, which is, to be cautious not to overſtock, as by that means great loſs may be ſuſtained, as "land when fed too bare is apt to burn in ſummer and to be chilled in winter. Beſides, the necks of the roots are ſo injured by very cloſe biting that they do not afford ſo quick or free a ſpring to the ſucceſſion of blade as there would otherwiſe be." But, on the other hand, it is not recommended to leave a long bite of graſs on the land: a middle degree will ſuit

* Marſhall's Rural Economy of Yorkſhire.

all lands the beſt, and afford the moſt benefit to the perſons who occupy them*.

By the too thin ſtocking of paſtures, though loſs may be ſuſtained in their not ſupporting the proper number of animals, as well as from the injury which is done by the graſs plants running ſo much up to ſtems, the broken graſs, in ſuch caſes, can be mown when in ſufficient proportion for hay; but the diſadvantages of overſtocking are ſcarcely capable of being repaired, as, beſides the lands being often expoſed to much injury by the crowns of the plants being ſo cloſely pared down, eſpecially in the finer kinds of graſs, the cattle from ſuffering a check in their feeding are long in regaining their former thriving diſpoſition†. It has been well remarked, that almoſt the whole of the produce of paſture lands may in this way be often thrown away, and that it is an error that young farmers are extremely liable to fall into‡.

The medium degree of ſtocking, which has been adviſed above, is in general to be carefully adopted from the experience obtained upon the land. In the procuring of which it is beſt to begin by an under proportion of ſtock §.

It is the opinion of a writer of great experience, that the more various the kinds of cattle are that are fed upon the paſtures at different times the better ‖. But it has not been ſhown on what principle this advantage depends. If the different modes of feeding in the different animals be attended to and minutely examined, it will be found that though ſome ſorts may conſume graſs when in a more luxuriant ſtate of growth than others, they are all fondeſt of paſturing on that which is the moſt ſweet and tender. This is rendered extremely obvious by the obſervations of an attentive inquirer, who has found, that although horſes "appear partial to particular patches of ſward, he has never been able to diſcover any peculiarity in the ſoil or the herbage of ſuch barely eaten ſpots." It is ſuppoſed that they have been fed down by ſuch animals at firſt in ſo cloſe a manner merely by accident; but that afterwards they are kept in ſuch a cloſe ſtate of feeding from "their peculiar ſweetneſs," depending on the "peculiar ſhortneſs of the herbage¶." It would, however, ſeem more probable, from the circumſtance of the animals being almoſt wholly directed by the taſte in the choice of their food, that the ſweet or tender nature of the herbage in theſe parts firſt induces them to feed upon and conſume them in ſo cloſe a manner, as well as the continuing the cloſe eating them down afterwards. The ſame thing is obſerved to happen in the vicinity of preſerved covers, with hares and rabbits, from their

* Kent's Hints. † Marſhall's Rural Economy of Yorkſhire. ‡ Ibid.
§ Ibid. ‖ Kent's Hints. ¶ Ibid.

keeping ſpots of barley or other grain crops cloſely fed down *. And ſheep are well known to ramble over the whole of the paſtures in order to nibble and pick out the moſt ſweet and delicate morſels.

The feeding of neat cattle is, perhaps, leſs particular and delicate in this reſpect; but where not forced by hunger they moſtly appear to fix upon ſuch parts of the land as poſſeſs the moſt ſweet and palatable herbage, rejecting the coarſer ſpots where it is leſs tender and agreeable.

If the concluſion be therefore well founded, that ſtock of all ſorts prefer the beſt, ſweeteſt, and moſt tender herbage, it is evident that no mixture of animals can inſure the even and regular feeding down of paſtures, as they will in ſome degree be all attracted by the ſweeteſt and moſt tender parts, and thoſe of the more coarſe four kinds be in conſequence almoſt wholly rejected. An agricultor of great experience and nice obſervation has remarked, that in paſtures ſtock naturally pick the moſt palatable graſſes firſt, leaving the others to run up to bents; and though it is admitted that one ſort may have a preference for one ſpecies of graſs and another for another, there is no mixing the animals in ſuch a manner as to prevent this circumſtance from taking place. It is wholly impracticable to proportion each kind of ſtock in ſuch a way to the ſpecies of graſs that may be moſt agreeable to it, as to prevent the ſcarcity of one ſort and the abundance of the other †.

Theſe are therefore not only difficulties in the regular feeding down of paſtures, from the cattle being more fond of ſome ſorts of herbage than others, but alſo from the inability of the grazier to proportion them in a way that may fully anſwer the purpoſe.

There obſervations, at the ſame time that they ſhow the difficulty of the buſineſs, convince us of the advantage and importance of keeping paſture lands regularly and evenly fed down, which is perhaps only to be fully effected by one ſort of ſtock properly ſucceeding another, till the want of the finer ſorts of herbage obliges them to feed upon thoſe that are of a more coarſe nature. In this, as well as other views, the fattening ſtock ſhould be firſt turned into the lands and kept upon them ſo long as they continue to improve in a proper manner; theſe may then be ſucceeded by the older ſorts of cattle that require to be brought into condition, and the more young ſtore ſtock may conſume the remainder of the graſs, according to the intentions of the farmer. That great utility and advantage may be derived from often ſhifting the cattle by having recourſe to a *head* ſtock and proper *followers*, there can

* Marſhall's Rural Economy of Yorkſhire.

† Cloſe in Communications to the Board of Agriculture, Vol. III.

be little doubt. The few writers that have touched upon the ſubject of graſs huſbandry have in general, indeed, recommended the practice as highly beneficial both in reſpect to the paſture and the ſtock. And Mr. Marſhall, in his Rural Economy of Yorkſhire, ſpeaks of this being a defect in the graſs land management of that diſtrict. The correct graſs farmer ſhould, therefore, be more attentive to this part of his management than is commonly the caſe, taking care that the changes of his ſtock are made in a ſeaſonable and judicious manner.

This is probably a practice from which greater utility may be derived than that of permitting many different ſorts of ſtock upon the ground at the ſame time, as, beſides their not anſwering the intention of feeding the paſtures down with more regularity and evenneſs, they are inconvenient and diſadvantageous in other reſpects. For where the paſtures are fed down with a mixed ſtock, the animals ſeldom thrive or fatten ſo well as where the contrary is the caſe. They are too much driven about and diſturbed by the different kinds teaſing each other, eſpecially where horſes and neat cattle are put together. A mixed ſtock is alſo improper in another point of view: many ſorts of animals feed cloſer and more expeditiouſly than others; of courſe, when there happens to be any ſcarcity of feed, ſome of the kinds may be greatly injured from the want of proper ſupport. The horſe, like the ſheep, feeds cloſe and quick, while the contrary is the caſe with the cow: it would of courſe ſeem improper to mix horſes with neat cattle in the paſturing of graſs lands, though the practice has been prevalent in many places. It has indeed been obſerved, that ſheep and horſes may feed and thrive beſt together, both from the ſimilarity of their manner of eating, and that of the former conſuming the rich luxuriant herbage which ſprings in conſequence of the manure dropped in the ſeaſon, while the latter prefer the leſs vigorous but the more clean graſs*. It is a practice, however, that has ſometimes been found uſeful, to mix ſheep with neat cattle. The notion of deriving advantage from the mixing of ſtock, from the circumſtances of ſome ſorts having a greater diſlike to feed near their own dung and leſs towards that of others, is probably not founded on juſt obſervation, as all animals have a fixed averſion to both their own and that of other animals, and none of them will feed near either till compelled by the ſcarcity of food. This averſion does not, perhaps, depend wholly on the dung, but is in ſome meaſure avoided in conſequence of the graſs becoming rank and coarſe about ſuch places.

As it is a matter of importance to keep paſtures and grazing-grounds as even as poſſible, a proportion of ſtock fitted to produce this purpoſe ſhould always be put

* Corrected Report of Perthſhire.

upon the lands. On the rich and more fertile kinds, where the graſs ſprings quick and in greater abundance, more ſtock will be neceſſary to effect this purpoſe than where the contrary is the caſe. It has been found on the marſh lands in Lincolnſhire, that where the moſt graſs is left in the autumn the herbage is the coarſeſt and the worſt in the ſucceeding year. In the extenſive feeding tract of Romney Marſh, the cloſe feeding ſyſtem is alſo found to anſwer in the moſt perfect manner*. Theſe facts ſhow the neceſſity of hard ſtocking on the richer deſcriptions of land. In other parts of the firſt of the above diſtricts, on turning upon a full bite in the ſpring, they ſtock in ſuch a manner as to prevent the graſs from becoming coarſe by running up to ſtem. The neceſſity of ſweeping over the rough tuſty parts by the ſcythe is thus avoided, except in very wet ſeaſons†.

It is a practical remark of a cautious obſerver, on deſcribing a field not ſufficiently ſtocked, that, on the marſh juſt mentioned, the grazing farmers would be ruined if they ſuffered ſo much graſs on their lands‡. And it ſeems to be a bad practice to allow the graſs in paſtures to advance to ſuch a ſtate as to require being ſwept over by the ſcythe, though it may be right to do it under ſuch circumſtances, in order to prevent the greater injury that might otherwiſe be produced.

It appears extremely probable, indeed, that by permitting the graſs plants to run up to ſeed-ſtems, the paſtures may ſuſtain vaſt injury, not only by the exhauſtion of the ſoil that takes place during the efforts of the plants to form and fill the ſeeds, but in conſequence of their whole vegetative powers being directed to that purpoſe, from their ſending forth few or no leaves. This is extremely evident in all the coarſer ſorts of graſs plants, and fully explains the utility of keeping them cloſely fed down, as by ſuch means a more abundant graſſy herbage is provided for the ſupport of ſtock. There are various obſervations that ſeem to ſupport this opinion. Thus, it has been recommended to ſtock paſture lands in ſuch a manner as will keep the graſs in a young ſucculent ſtate; as in this way there is a benefit, by the whole of the produce being conſumed, and at the ſame time the ſtems of the graſs plants are prevented from ſeeding, which exhauſts the roots and the lands: the ſoil is of courſe preſerved in a better ſtate of fertility, more ſhoots are thrown out, the ſward is rendered more cloſe, and a more conſtant verdure kept up§. "The true principle of grazing," in the opinion of the ſame writer, "is to eat *all*, and particularly at thoſe ſeaſons when vegetation is rapid, that it may not weaken

* Mr. Young in Lincolnſhire Report.
† Boys in Annals of Agriculture, Vol. XIX.
‡ Ibid.
§ Price in Annals of Agriculture, Vol. XXI.

the turf and ſoil, but, by keeping the graſs in a young ſtate, have the ſhoots more vigorous."

As for the purpoſe of feeding the larger ſorts of neat cattle, it is neceſſary for the graſs to have grown to a pretty full bite before they are turned in, and of courſe numerous ſeed-ſtems to be formed; it ſeems not improbable, but that the ſuperior benefit of feeding with ſheep may depend upon the circumſtance of their eating more cloſely, and thereby preventing ſuch effects from taking place.

In the ſtocking of paſture grounds the growth of the graſs ſhould be particularly attended to, and the proportion of ſtock adapted to it; care being always taken to have a full proportion during the ſummer months, from May to Auguſt; a proper reſerve being then made for the winter ſeaſon *. In this buſineſs the farmer ſhould be as careful as poſſible to neither over or under ſtock, as by either means he muſt ſuſtain loſs and inconvenience.

There is another point, in reſpect to the eating down of paſture lands, upon which farmers differ very greatly in their opinions, each contending for the propriety of their practice on the ground of experience: this is that of giving the cattle, of whatever ſort they may be, the whole range of the lands, however extenſive, at once, or by having them divided ſo as to let them have the graſs at different times in a freſh unbroken ſtate. The queſtion does not appear to have been examined in that view, or with that degree of attention which is ſufficient to fully decide the matter; and there are obviouſly various circumſtances, ſuch as thoſe of the inequality of grounds and ſtocks, which muſt continually operate againſt its being determined by the teſt of experiment. It ſhould probably be diveſted of thoſe advantages that may ariſe from the circumſtance of incloſure, as drainage, ſhelter, water, &c. in order to be fairly aſcertained, and be merely conſidered as to whether there may not be more economy or leſs waſte in the conſumption of the graſs in one way than in the other? and whether it may not go further in feeding or fattening the ſtock in one method than in the other? As the animals will not, of courſe, remain upon the ſame ſpot, the difference in reſpect to the diſadvantage that may ariſe from the trampling down and ſpoiling the graſs in that way, muſt be pretty equal in both methods of proceeding. In the firſt mode there will, however, be more difficulty in proportioning the ſtock to the conſumption of the herbage, as well as more trouble and inconvenience in tending it; which are circumſtances of importance. In what regards the graſs being eaten with greater freſhneſs in

* Price in Annals of Agriculture, Vol. XXI.

one caſe than the other, it is obvious that the conſuming the herbage in a divided ſtate muſt have what little ſuperiority there may be, as each time the cattle are let into a new piece of graſs it will be perfectly freſh; which in the contrary caſe can only be ſo at the firſt putting the animals in, as they moſtly trample over the whole before they ſettle to feed quietly on any particular part. But there are other points of more conſequence that ſeem to favour the feeding paſture lands in a divided ſtate; ſuch as thoſe of the cattle not grazing ſo quietly in large herds as in ſuch as are ſmaller; and where any diſturbance happens, either from accident or neceſſity, the whole being diſturbed inſtead of only a part. Beſides, it is found, as has been ſhown above, that all ſorts of ſtock, when duly proportioned to their paſtures, thrive better in ſmall than large numbers together, being leſs liable to teaſe and diſturb each other.

The experience of a writer, who has examined graſs huſbandry with much minuteneſs and attention in different diſtricts, would ſeem alſo, in ſome meaſure, to favour the ſame concluſion, while it ſhows the benefit of one ſort of ſtock following another, as he adviſes that "in all caſes where fattening cattle or dairy cows conſtitute a part of the ſtock; and where ſoil, ſituation, and water will admit, every range of grazing lands ſhould have three diviſions: one for the head ſtock, as the cows and fattening animals; another for followers, ſuch as the rearing or other lean ſtock; and a third for being preſerved in order to freſhen for the reception of the principal ſtock*." And he is decidedly of opinion, "that whether the ground may conſiſt of one, two, or a greater number of diviſions, not a weed ſhould be ſuffered to ſeed, or a tuft of ſtale graſs to ſtand on it; but once, at leaſt, in the ſummer ſeaſon be levelled down by the ſcythe, as by ſuch means weeds may be converted into nouriſhment, "and waſte ground into after-graſs."

The practice of cloſe feeding, as recommended above, may, in many caſes, render this unneceſſary, and at the ſame time afford a ſuperior advantage to the farmer.

The proportions of ſtock of different ſorts that can be properly ſupported on any given ſpace of paſture ground muſt vary conſiderably, according to the natural goodneſs of the ſoil, the properties of the graſs, and the differences in the ſizes of the animals. There is likewiſe another circumſtance which ſhould be attended to, which is the length of time the land has been in the ſtate of ſward, as new lays are ſeldom capable of carrying ſo much ſtock on the acre as thoſe of the older kinds. It is alſo a point that ought to be attended to, that theſe lays ſhould be ſtocked as

* Marſhall's Rural Economy of Yorkſhire, Vol. II.

much as poſſible with ſheep. To give any ſtatement of the number of animals that may be grazed on the acre would not only be uſeleſs, but be liable to lead the young farmer into error, as it muſt differ ſo greatly in the manner that has been juſt noticed. Beſides, the porportion of different ſorts of ſtock that is put upon the grazing lands, in different diſtricts, will be ſeen when we come to ſpeak of the manner of feeding or fattening animals at graſs.

Lands employed for the purpoſe of paſture are frequently occupied by ſtock during the autumn and winter, as well as the ſpring and ſummer months: it is, however, only thoſe of the very dry kinds that can be turned upon in the winter ſeaſon, eſpecially by heavy cattle; and it is probably, in all caſes, a much better practice to confine that ſort of ſtock wholly to the fold-yards at ſuch ſeaſons, as by ſuffering them to be turned upon the paſtures there muſt be a great loſs in the waſte of manure.

It has been found an advantageous practice by ſome to ſhut up their paſtures late in the autumn, according to the ſtate of the graſs and other circumſtances, eating them down as cloſe and evenly as poſſible previous to the ſtock being removed, and keeping them perfectly free till they are wanted for ewes and lambs in the early part of the year, or for cattle at a later period, as when the firſt ſhoots appear in the ſpring, which from being intermixed with thoſe of the autumn, are ſuppoſed to afford more nouriſhment for the ſupport of the ſtock than when either of them are eaten ſeparately *.

In fields that are paſtured by cattle, care ſhould be taken that all ſuch plants as are hurtful to ſtock be completely eradicated, as much injury is often done by them to the cattle as well as the products which they afford. The plants moſt prejudicial in this way are thoſe of the hemlock, henbane, nightſhade and yew kinds. It has been obſerved, that while the graſs is plentiful there is not much danger of their feeding upon ſuch plants; but when it becomes ſcarce, and they are confined, it is likely to take place, eſpecially in the ſpring ſeaſon †.

Drinking-Ponds.—There is another circumſtance in reſpect to paſture lands, that it is indiſpenſably neceſſary to attend to, which is that of their being well ſupplied with water, as without having this in ſome degree at command, it is impoſſible that the ſtock can thrive well, or anſwer in the moſt perfect manner in other views. Where they are not therefore ſupplied by brooks or ſtreams running through them, it will be neceſſary to have recourſe to the forming of ponds, or pools, for the purpoſe in the fields. In ſituations where the natural ſtratum of clay is of conſiderable thickneſs, there is little diffi-

* Marſhall's Rural Economy of Midland Counties, Vol. I. † Perth Corrected Report.

culty in the conſtructing of watering ponds ſo as to be perfectly retentive; but in looſe porous ſoils the buſineſs is not executed without conſiderable art and attention. Even in clayey lands, except the ponds be kept conſtantly filled with water they are liable to become leaky. This has been ſuppoſed to depend upon the cracking of the clay by drought, and the perforations of worms, the baſons being converted by ſuch means into a ſort of filters *. Theſe inconveniences are of courſe to be guarded againſt in their conſtruction; which are partly effected by the proper application and puddling of the clay as the work proceeds, and the uſe of a coat of lime below it. It is of great advantage alſo, in preventing the clayey ſtratum from being injured by drought and the poaching of cattle, to have coverings of earth, coarſe gravel, or ſmall ſtones laid over the clay. The ſides or parts of the ponds which are to admit the cattle to drink ſhould be well ſloped down, ſo as that they may enter with eaſe and the leaſt poſſible injury to the bottoms of the ponds.

In reſpect to their ſituation, it is the moſt uſual to make them at the bottoms of ſlopes or riſing grounds; where after heavy rains a ſlight run of water may be conveyed into them, from ſome road, or other firm ſurface; many are, however, placed without any ſuch aſſiſtance for filling, or with very little, it being found that the rain that falls upon their ſurfaces is in general ſufficient for a ſupply, after they have been once filled †: but in many caſes, as the expenſe is conſiderable, it would ſeem more advantageous to have them formed in the angles or corners, where two or three fields meet, as by this means one pond may ſerve the whole, and at the ſame time but little ſpace of ground be taken up or waſted. It has been ſuggeſted as highly uſeful in the forming of theſe drinking-ponds, to have a waſte-water place on the upper ſide of the main reſervoirs, to prevent their being uſeleſsly *filled* up when full by the muddy water continuing to run into them; as by its changing from a running to a ſtagnant ſtate a conſiderable depoſit takes place, which might thus be avoided ‡. Much mud would alſo be collected in this way, in many caſes, and be removed with little trouble; which renders them of great utility in procuring manure.

It has been obſerved that "the beſt ſeaſon for making theſe ponds is thought to be in autumn, as they are then likely to be filled the ſooneſt, and the leaſt liable to crack before they are filled. Should the weather prove dry at the time they are finiſhed, it is well to cover their ſurfaces with ſtraw, or litter, to hinder them from "cracking." And "as it is deſirable to get them filled as ſoon as poſſible after they

* Marſhall's Rural Economy of Yorkſhire.

† Corrected Report of the North Riding of Yorkſhire. ‡ Ibid.

are finiſhed, ſnow is frequently collected and heaped upon them, if poſſible, in large quantities, the firſt winter after they are finiſhed, for that purpoſe*."

The form of ponds for this uſe is in general that of a ſhallow baſon, the ſides ſhelving in a gradual manner from the brim to the centre. But other forms may be adopted according to circumſtances. In the firſt mode, where the excavation is ſixty feet in diameter, the greateſt depth is about ſeven; but when only forty feet in diameter, the depth is moſtly about five, before any of the coats are applied†. There would ſeem, however, to be an advantage in having ſuch ponds of greater depths and leſs diameters, as it is well aſcertained that the quickneſs of evaporation is in a great meaſure in proportion to the extent of ſurface that is expoſed to the influence of the atmoſphere: of courſe ſuch ponds as have great diameters with little depths, muſt become dry in hot ſeaſons much more quickly than where the contrary is the caſe.

In ſetting out ponds of this ſort, the uſe of the *level* will be neceſſary; ſtakes being driven down as a guide to work by in forming the banks, and in making the conducting channels and waſte-water pools. The materials raiſed from the excavations muſt be taken away or applied according to the circumſtances and ſituations of the land; but wherever the ſorts of looſe materials are employed, great care ſhould be taken to have them well wrought together, in order to give them due ſolidity.

The expenſe of forming ponds of this kind muſt vary greatly according to the ſituation, the nature of the ſoil, and various other cauſes. They are "uſually made by men who go about for the purpoſe, and are chiefly, or entirely, engaged in it, and who uſually contract for the job. One of the diameter of ſixty feet and depth of ſix feet may in moſt ſituations be executed for about 15l.;" and "one of forty-five feet by five feet, for 10 or 12l.; but ſome allowance muſt be made for the different prices of lime, and the diſtance it may be neceſſary to convey it, as well as the clay, or the other materials for the work. A pond of ſixty feet diameter by ſix feet deep, will contain upwards of 700 hogſheads of water; one of forty-five feet by five feet, near 400 hogſheads—a vaſt ſupply, when obtained at ſo ſmall an expenſe."

Mr. Marſhall in his Rural Economy of Yorkſhire, where the ſubject is fully conſidered, has calculated the expenſe of each ſquare yard of coated ſurface to coſt from ſixpence to ſevenpence halfpenny; which at preſent would probably coſt ninepence or tenpence‡.

* Corrected Report of the North Riding of Yorkſhire. † Ibid.

‡ It is remarked in the Agricultural Survey of the North Riding of Yorkſhire, that the improved practice of conſtructing ponds of this ſort is capable of ſucceeding in almoſt any ſituation in any diſtrict.

In ſpeaking of farms on the Mendip hills, Mr. Billingſley, in the Agricultural Report of Somerſetſhire, mentions a method of conſtructing drinking-pools for

The following, which is chiefly drawn from Mr. Marſhall's Rural Economy of Yorkſhire, is the method recommended for executing the buſineſs.

"Let a circle be marked on the ground ſixty feet in diameter, more or leſs as the perſon chooſes, or the ſize of the paſture may require a ſupply of water; and if of that diameter, let it be hollowed out in the ſhape of a baſon, or bowl, to the depth of ſeven feet in the centre. When the ſurface of this hollow has been raked ſmooth, let it be well beaten over ſo as to reduce it into as even, uniform, and firm a ſurface as the nature of the ground will admit of; on this, well ſallen, ſkreened lime muſt be uniformly ſpread with a riddle, to the thickneſs of two or three inches; the more porous or open the ground, the greater will be the quantity of lime required: this lime muſt then be ſlightly watered, to make it adhere firmly to its place, and great care muſt be taken to ſpread it equally, ſo that no place remains uncovered, as on the lime depends, more than any thing elſe, the ſucceſs of the work. On this lime muſt be laid a bed of clay, to the thickness of about ſix inches, which, being moiſtened ſufficiently to render it ductile, is to be beaten with mallets, or beetles, into a ſolid compact body, capable of being trod upon without impreſſion or injury. Great care is to be taken in laying on uniformly this maſs of clay, and beating it into a compact body; for which purpoſe not more muſt be ſpread at a time upon the lime than can undergo the beating while it retains a proper temper or conſiſtence for the purpoſe: after the whole is thus finiſhed, it is gone over ſeveral times by the beaters, and ſprinkled each time with water, and care is taken to prevent any cracks being formed, which might entirely deſtroy the power of retention.

"Pure brick-clay is not required; but any tenacious earth, that by beating will become of a ſolid compact body, will anſwer the purpoſe. As ſoon as this operation has been duly performed, the whole ſurface of the clay is covered, to about the thickneſs of a foot, with broken chalk, fine gravel, or the chippings of mouldering ſtone, or limeſtone, to prevent any injury being done by the treading of the cattle. It is neceſſary to obſerve, that coarſe ſtones, or any ſtones of a texture that will not unite into a ſolid body, muſt not be made uſe of, as ſuch are liable to be diſplaced by the treading of the cattle, to be preſſed into or through the bed of clay, or to be rolled down to the bottom of the pond; under all which circumſtances the beds of clay and lime are liable to be broken, and the water conſequently let out of the pond. Sometimes the clay is covered with ſods, the graſs ſide being laid downwards, as a ſupport to the gravel, by which ſome ſaving of covering may be made; or ſeveral inches thick of common earth is laid upon them, or upon the clay without the ſods, by way of bed for the covering, where gravel or ſuch like materials may be ſcarce; by which ſomething may be alſo ſaved.

"After the clay has been well beaten, ſome workmen water the ſurface of it, and fold ſheep or pigs for a conſiderable time upon it; the treading of which is found to be ſerviceable in rendering it more compact.

"Some people, inſtead of uſing ſlaked lime, have good mortar made of lime and ſand well worked together, and cover the ſurface of the ground with it to the thickneſs of about an inch: this, if carefully done, is thought by many to be the moſt effectual mode of rendering the bottom retentive; but the mortar is liable to crack before the clay gets bedded over it: which muſt be carefully guarded againſt. Ponds have been made where a coat of mortar has alſo been ſpread over the ſurface of the clay as well as under it—an approach, perhaps, as near as poſſible to perfection—but where lime bears a high price, the expenſe is thus conſiderably augmented.

cattle by means of maſon's work, as on ſuch elevated regions ſprings are ſeldom to be met with. Such ſkill is diſplayed in the forming of them that they ſcarcely ever let the water through or prove leaky *.

In cattle drinking-ponds it is a circumſtance of great importance to the health of the animals to have the water as pure and free from impregnations as poſſible; but it is extremely difficult to provide it in ſuch a ſtate except where the water is in conſtant motion: ſomething might probably, however, be done, eſpecially where waſte-water pools are provided, in rendering the water more pure, by having it, in its paſſage to the large reſervoirs, percolating through a ſufficient body of coarſe ſandy or gravelly materials ſo confined as to prevent their being carried away.

Cow-keeping.—This is a practice from which much profit and advantage may be derived in particular ſituations and circumſtances, as where the land lies near large towns, and is highly fertile and productive in good herbage; and where in addition to this the farmer has the means of conveniently providing various other ſorts of food, either of the ſucculent green or other kinds. But to undertake this ſort of management under the contrary circumſtances could only terminate in loſs and diſappointment.

"Experience, now of many years, and the univerſal uſe of theſe ponds in this country, wherever wanted, have proved them when carefully made, ſo effectually to retain water; to preſerve it of ſo good a quality, when not fouled by the treading of cattle; and to be applicable to ſo many ſituations, that they cannot be too ſtrongly recommended in all high ſituations, where water may be much wanted, or in all other ſituations where the water may be of a bad quality: they are equally applicable to our dry wolds, downs, and heaths, which are without water, as to every fenny tract which has too much of it, but of a brackiſh or unwholeſome quality."

* It is ſtated that ſuppoſing the dimenſions to be forty feet in length, ſixteen in width, and ſix feet in depth in the middle, the expenſe may ſtand thus:

	£.	s.	d.
"Digging out the foundation *	2	2	0
Maſon's labour	10	10	0
Three hundred buſhels of lime	3	0	0
Ten loads of clay and carriage	1	0	0
Eight loads of coal-aſhes and carriage	1	8	0
	18	0	0

"Some perſons, who are cautious, go to a conſiderable diſtance for lime made from the *white lyas* ſtone, which is certainly a ſtronger cement under water than the lime burnt on theſe hills. In this caſe an additional expenſe is incurred.

"A pool of theſe dimenſions, if properly ſituated, will ſupply eighty or one hundred acres with a ſufficiency of water for the ſtock throughout the year, and, if well made, may be kept in repair for ſixpence a year."

* In moſt caſes this will furniſh a ſufficient quantity of ſtone for the building.

But, beſides theſe, there are other circumſtances to be regarded in the conducting the buſineſs of a milk-dealer, ſuch as thoſe of providing cows that afford the largeſt poſſible quantity of milk in proportion to the food they conſume. This is a point that does not ſeem to have been much ſubjected to experiment, though the profits of the farmer muſt in a great meaſure depend upon it, as where ſuch cows are employed as do not anſwer in this view, a daily loſs muſt be ſuſtained. As this ſort of farming is in moſt caſes, as has been obſerved, only capable of being carried on with advantage in ſituations where the food is of the moſt rich and ſuitable kind, and capable of being provided in ſufficient proportion to feed the animals in a plentiful manner, it would appear not improbable but that the large breeds may in general be the moſt proper for the purpoſe. But when attempted in other circumſtances, where the food is neither ſo good in quality nor able to be provided in ſuch abundance, breeds of a ſmaller deſcription may be preferable, as it never can anſwer the farmer's purpoſe in this, or probably any other view, to have the cattle diſproportioned to the nature and quantity of his keep. The inclination or tendency to feed in animals for this uſe is likewiſe a circumſtance to be attended to by the cow-farmer, as where it is diſcovered to prevail they ſhould be rejected as improper; it being found from experience that ſuch cows as poſſeſs this property ſeldom or ever afford much milk. The diſpoſition of cows has alſo ſome influence in reſpect to the quantity of milk which they may afford, as ſuch as are mild and gentle in general milk much better than where the contrary is the caſe.

The ſort of cow moſt adapted to the intentions of the milk-farmer muſt of courſe vary, according to the nature of his ſituation and the means which he poſſeſſes of providing food. Under the firſt circumſtances, the large ſhort-horned, or Holderneſſe breed, may commonly be the moſt advantageous; but in the latter, the long-horned, the Suffolk, Polled, and the Alderney breeds may be more profitable. There are likewiſe other breeds of the ſmaller kinds that may be found beneficial in theſe caſes*. It has, however, been ſuggeſted as not improbable, but that though the large breed juſt mentioned may at firſt, while there is a full ſupply of green or other juicy food, afford a very large quantity of milk, the ſmaller ſorts continue to give a more regular quantity for a greater length of time †.

Whatever the breed of cows may be that is employed by the milk-farmer, he ſhould conſtantly chooſe ſuch as are wide in the horn, thin in the head and neck, dewlap not too pendulous, the carcaſe deep and flattiſh, wide (rather pointed) hips, buttocks round and fleſhy, legs thin, with ſhort joints, the udder capacious, not

* See Dairying. † Anderſon's Recreations in Agriculture.

fleſhy, but extending well backwards, the milk-veins large and prominent, and the teats long and large. A tame and gentle diſpoſition is alſo, as has been ſhown, a circumſtance of importance. The beauty of form is therefore never to be attended to in providing cows for the ſupply of the milk-dealer. It is chiefly the quantity of milk that is to be regarded; of courſe, all ſuch cows as do not afford a *full* ſupply ſhould be diſpoſed of as ſoon as poſſible, as being very unprofitable in this ſort of management.

Cows moſtly come into milk about the third year of their age, and are in full milk at the fifth, and they may be continued to the eighth or tenth, according to circumſtances. But in the practice of cow-keeping, from the high manner in which the animals are kept, it is neceſſary to change them much more frequently. With reſpect to the exact length of time that they may be continued as milkers with the moſt advantage, it does not ſeem to be well aſcertained by experiment; but it is probable that it cannot be more than two, three, or four years at the moſt, though much muſt undoubtedly depend upon the conſtitution of the animal. It is the beſt, however, not to keep them too long, as the vigour of ſecretion is much leſs in old than young animals; and beſides, they become more liable to ſwellings and indurations in the udders, as well as other diſeaſes *.

The age of cows is readily known by their ſhedding the tips of their horns at three years old, and the firſt rings commencing at the bottoms of them at four †.

The cow-keepers in the county of Middleſex almoſt wholly employ the large Holderneſſe breed, which are brought from a diſtrict thus denominated in Yorkſhire, as well as others in the ſame neighbourhood, where the moſt perfect of this kind of cows are met with ‡. It is obſerved that the dealers in this ſort of cattle buy them of the breeders when they are three or four years old, and in calf, expoſing them to ſale afterwards at the fairs and markets in the county, particularly near the metropolis, where there is a freſh ſupply from the country weekly, by means of which the cow-keepers are enabled to keep up their ſeveral ſtocks. Great numbers of cows are likewiſe bought in the above places in lots of ten or twenty, by private commiſſion, and forwarded to the reſpective cow-keepers in the above neighbourhood. The prices were formerly from ten to fifteen guineas, but for the laſt two or three years have increaſed to ſixteen or eighteen, and are now advanced to twenty or more. The cow-keepers breed very few cattle, and thoſe only from cows that

* Annals of Agriculture, Vol. XVI. † Ibid. Vol. XXXII.
‡ Corrected Report of Middleſex.

give much milk, and with very little attention to the choice of the bull. When keep is plentiful, the beſt ſeaſon for purchaſing theſe animals, in reſpect to price, is the autumn, or the beginning of winter*.

The length of time which cows go with calf is nine months. It is the practice with ſome to keep an account of the periods of their taking the bull; and where the ſtock is extenſive this is of much advantage, as it not only enables the farmer to calculate with more certainty on his ſupply of milk, but to have proper attention paid to them before as well as at the time of their calving; which is of much benefit to the animals.

There is a difference of opinion in regard to the diſtance of time they ſhould become dry before their calving, ſome contending, that they may be milked almoſt to the time of their dropping the calf without injury; while others maintain, that it is abſolutely neceſſary that cows ſhould be laid dry from one to two months, both for the advantage of themſelves and their calves. It is probable that much in this buſineſs muſt depend on the manner in which they are kept; as where they are well fed they may be continued in milk till within a week or two of their calving, without ſuffering any injury whatever from it; but in the contrary circumſtances it may be better to let them run dry for a month, ſix weeks, or more, according to their condition, in order to their more fully recruiting their ſtrength. It appears, however, not improbable, but that the longer the milking is continued, the more free the cows will be from indurations and other affections of the udder; which is a circumſtance deſerving of attention. Where only one or two cows are kept for the ſupply of a family, it is likewiſe uſeful to know, that by good feeding they may be continued in milk without any bad conſequences till nearly the time of calving. We have tried this method ſeveral times, without perceiving the leaſt poſſible injury to ariſe from it. And in the Agricultural Survey of the Weſt Riding of Yorkſhire it is ſtated, that no advantage was found on trial to reſult from allowing the cows "to go dry two months before calving." They have there been kept in milk till within ten days of the time of dropping the calf.

Where cows are kept in any great number, it is always an advantageous practice to keep bulls along with them, as by ſuch means they not only take them more readily, but are prevented from its being omitted through inattention; which is otherwiſe often the caſe. Beſides, the great trouble, inconvenience, and loſs of time in driving them to a diſtance, is avoided. From twenty to five-and-twenty

* Corrected Report of Middleſex.

or thirty cows are ſufficient for one bull. They ſhow their inclination for taking the male by riding upon the other cows.

After three or four months, cows may be aſcertained to be in calf by preſſing upon the off flank with the hand, as where that is the caſe the calf is found to ſtrike againſt it.

They are ſhown to be near calving by their ſpringing at the udder and the bearing; the former becoming more fully diſtended with fluid, while the latter is larger and more ſwelled out. Heifers, or young cows, are ſaid to ſpring the ſooneſt at the bearing, and thoſe of the older kinds at the udder.

From accidents and other cauſes, it ſometimes happens that cows *ſlip* or *ſlink* their calves before they are ſufficiently grown. Where this occurs, it is eſſentially neceſſary to remove ſuch cows immediately from the cow-yards, or from mixing with the other cattle, for a few days. But where cows are much ſubject to ſuch accidents it is the beſt method to get quit of them as ſoon as poſſible, as they will ſeldom turn out profitable.

In two, three, or four days, according to circumſtances, after the cows have calved, it is the practice of the London cow-keepers to ſend the new-dropped calves to be ſold, as they would not be ſaleable before. The cows are thus left in full milk from within a few days of the time of their calving. But in other ſituations that cannot always be the caſe, as the demand for ſuckling-calves is leſs; they muſt therefore be often ſuckled by the cow-keepers.

Where it is not the practice to bind up the cows in houſes for the purpoſe, eſpecially during the winter ſeaſon, which ſeems by much the beſt method, warm well ſheltered yards, with open ſheds, ſhould be provided, in order to protect the animals, and prevent their being expoſed to the weather, as by ſuch means they will afford much larger ſupplies of milk than where they are left in a ſtate of expoſure to wet and cold in open dirty yards, as is often the caſe. The bottoms of yards for this uſe ſhould be well laid with ſome ſort of hard materials, and the dung be frequently ſcraped off them, ſo as to keep them as dry and clean as poſſible. They ſhould alſo have plenty of good clean water to drink of at pleaſure. If due attention be not beſtowed in theſe reſpects, which is ſeldom done, it is impoſſible that the advantages that might otherwiſe be the caſe can be derived from them.

In the feeding of the animals it has been obſerved, that care ſhould be taken to keep them conſtantly in good condition, as where they are ever ſuffered to become very lean, and that in the winter ſeaſon, it is impoſſible to ſuppoſe that they can be brought to afford a large quantity of milk, by getting them into perfect.

condition in the ſummer months; as where cows are lean at the period of calving, no management afterwards is ever capable of bringing them to afford for that ſeaſon any thing near the proportion of milk that they would have done if they had been ſupported in proper condition during the winter*. Food of the moſt nouriſhing and ſucculent kinds ſhould therefore be regularly given in ſuitable proportions in the cold inclement months, and the animals be kept warm, and well ſupplied with pure water, in the way juſt mentioned†. Some adviſe their being cleaned by combing and other means; but this is a practice, which though uſeful in making them yield their milk more freely ‡, can perhaps ſeldom be employed on an extenſive ſcale.

In this ſort of buſineſs the cow-keepers find great advantage in keeping the animals conſtantly fed with different kinds of ſucculent food, ſuch as brewer's grains in a freſh unfermented ſtate, turnips, cabbages, green tares, freſh cut graſs, and ſoft green rouen, or hay that has undergone little or no fermentation in the ſtack:—By this means much juicy matter is thrown into the ſyſtem, and a continual varied ſtimulus kept up, by which a large increaſe of milk is produced. As the different articles thus employed muſt have leſs effect in exciting the ſecretory organs of the animals in proportion to the frequency of their uſe, the utility of varying their food as much as poſſible is rendered ſufficiently obvious. On the ſame principle there are probably various other ſubſtances, as well as theſe, that might be made uſe of with great benefit; but too few experiments have yet been made with them, in this view, to lead to any uſeful concluſions. There is another circumſtance, however, that deſerves the attention of the milk-farmer, in the feeding of his cattle, which is that of the dry food being properly proportioned to that of the green or rich ſucculent kind, as, where this is not well attended to, the cows, by being kept in too lax a ſtate of their bowels, from the great tendency which ſuch materials have to run off in that way, may afford a much leſs quantity of milk than would otherwiſe be the caſe. We know from repeated experiment that conſiderable loſs ſometimes takes place in this manner. In the foddering of the cows, regard ſhould alſo be had to ſupply them with the food in ſuch a way as to excite the ſecretions in as regular a manner as poſſible. In this view too much food ſhould never be given at one time, but ſupplied more frequently, as three or four times or oftener in the courſe of the day. This practice will likewiſe have an advantageous effect in having the fodder more cleanly eaten up.

* Anderſon's Recreations in Agriculture, &c. Vol. III. † Ibid.
‡ Corrected Report of the Weſt Riding of Yorkſhire.

The method of giving cows their food by the milk-farmers in the vicinity of the metropolis, where this buſineſs is carried on upon the moſt extenſive ſcale, is thus ſtated in the valuable Agricultural Survey of that diſtrict: "During the night the cows are confined in ſtalls; about three o'clock in the morning each has a half-buſhel baſket of grains; when the milking is finiſhed, a buſhel baſket of turnips is given to each cow; and very ſoon afterwards they have an allotment, in the proportion of one truſs to ten cows, of the moſt graſſy and ſoft meadow hay, which had been the moſt early mown, and cured of the greeneſt colour. Theſe ſeveral feedings are generally made before eight o'clock in the morning, at which time the cows are turned into the cow-yard. About twelve o'clock they are again confined to their ſtalls, and ſerved with the ſame quantity as they had in the morning. When the afternoon milking, which continues till near three, is finiſhed, the cows are again ſerved with the ſame quantity of turnips, and about an hour afterwards with the ſame diſtribution of hay as before deſcribed. This mode of feeding generally continues during the turnip ſeaſon, which is from the month of September to the month of May. During the other months of the year they are fed with grains, cabbages, tares, and the foregoing proportion of rouen, or ſecond cut meadow hay, and are continued to be fed with the ſame regularity until they are turned out to graſs, when they continue in the field all night; and even during this ſeaſon they are frequently fed with grains;" which are kept ſweet and eatable for a conſiderable length of time, in the following manner: This is by depoſiting them in vats, or pits, below the ſurface of the ground, treading them tightly down into them, and then covering them over with a layer of earth, ſo as to prevent the air from coming in contact with them, and thereby producing fermentation. In this way they may be continued in a perfectly ſound ſtate from the month of March till the ſummer, when the brewing is diſcontinued. They are alſo capable of being preſerved when well trodden down into caſks or tubs, which have perforations in the bottoms for the purpoſe of draining off the ſuperabundant moiſture: theſe ſhould be raiſed to ſome height from the ground by pieces of timber. In country ſituations it will ſeldom be neceſſary to preſerve them in this way, as they will chiefly be wanted in the winter ſeaſon.

Near Leeds in Yorkſhire, the milk-dealers in ſome inſtances feed their cows with cut graſs in the ſummer ſeaſon, and brewer's grains and oat ſtraw in the winter. And in the vicinity of Sheffield the "moſt experienced cow-keepers give five hundred weight of linſeed duſt mixed with three hundred weight of bran per week to ſix cows; others give a quarter of a peck of beans, with a peck of grains for one feed

for one cow, three times a day*." Theſe are probably too expenſive methods to be generally adopted; but as they are found to anſwer well, they may be employed with advantage in particular ſituations. It is remarked in the Agricultural Survey of Middleſex, that "ſome cow-keepers have tried ſalt mixed with the grains, more with a view to preſerve the grains longer in a ſound ſtate, than from any conſideration as to the health of their ſtock, or the improvement of the quality of the milk. It is acknowledged that the cows eat the grains ſo mixed with great avidity; but the proprietors not getting an adequate return for their trouble and expenſe, it is not found that it is now much practiſed." It has however been contended, that the mixing of common ſalt with the food of cows not only improves the quality but increaſes the quantity of the milk, and at the ſame time is ſerviceable to the health of the animals; but accurate experiments are wanting to fairly determine the queſtion.

The obſervations of Baron D'Alton on the management of theſe animals, go to prove by various accurate calculations, that a greater profit is capable of being derived from the keeping of them in the houſe than in the uſual method of allowing them to feed in the paſtures. And the author of the Agricultural Survey of the Weſt Riding of Yorkſhire has remarked, that by keeping cows upon red clover and rye graſs, tied up in the houſe in the day-time during the ſummer ſeaſon, and putting them out after milking in the evening for the purpoſe of air and water, one acre of clover has been found to go as far as two when paſtured; beſides a larger quantity of milk afforded. The large portion of rich manure that is made in this way is ſuppoſed to compenſate any additional trouble or expenſe that may be incurred in cutting and conveying the food to the yards. In this method of keeping cows, as well as thoſe with grains and other ſorts of ſucculent food, it is conſtantly neceſſary, for the reaſon that has been mentioned, to combine ſome ſort of dry meat, ſuch as hay, ſtraw, or other ſimilar materials, with the graſſes. In ſoils where lucern can be grown to advantage, it may be made uſe of with more benefit than the above; and by combining other ſorts of green juicy food with either of them, it ſeems not improbable but that a ſtill greater profit may be produced. Of the ſuperior advantage of keeping milch cows in this method there can be little doubt, when conſidered in different points of view.

In the milking of cows, more attention is probably neceſſary than has hitherto been beſtowed upon the ſubject, in order to obtain the greateſt poſſible quantity of milk. On the phyſiological principle of the ſecretions of animals

* Corrected Agricultural Report of the Weſt Riding of Yorkſhire.

being increaſed in proportion as the ſecreted fluid is more frequently withdrawn, it has been recommended to have recourſe to more frequent milkings in order to augment the quantity of that fluid in cows. And there can be little doubt but that by accuſtoming the ſecretory organs to a more frequent ſecretion, ſuch a habit may be eſtabliſhed in them as will afford a larger proportion of milk in a given time. But in order to effect this in the moſt perfect manner, it will be neceſſary to have the cows highly fed, and to obſerve the greateſt regularity and exactneſs in the periods of milking, and to be careful that every drop of milk is drawn away each time, as without due regard in theſe reſpects the deſired effect will not be produced. This is fully ſhown to be the caſe by the few experiments that have been inſtituted with the view of deciding the matter; as while the cows were conſuming the more juicy ſpring food, there appears to have been an increaſe in the quantity of milk both by three and four milkings in the day; but in the autumn ſeaſon there ſeems to have been rather a decreaſe under the ſame circumſtances*.

Such trials, to afford any ſatisfactory concluſions, ſhould have been continued for a much greater length of time, being varied conſiderably in the times of milking, and nicely compared with the nature and quantity of the food employed; as it is only by aſcertaining how much depends upon the ſimple operation of taking away the milk, and how much upon the quality and proportion of food that is taken in, that the queſtion can be fairly decided. It is not to be ſuppoſed that merely

* In order to aſcertain the advantages to be obtained in this way, the following experiments were made by Mr. Macro, and are ſtated in the twelfth volume of the Annals of Agriculture:

1789.		Pints.	1789.		Pints.
May 21,	Firſt meal	9½	October 22,	Firſt meal	11
	Second do.	13		Second do.	6
		22½			17
22,	Firſt meal	13	23,	Firſt meal	11
	Second do.	8		Second do.	3
	Third do.	5		Third do.	3
		26			17
23,	Firſt meal	12	24,	Firſt meal	10
	Second do.	7		Second do.	1½
	Third do.	6		Third do.	1½
	Fourth do.	1		Fourth do.	3
		26			16

increafing the number of milkings for a few days can have much influence in altering the ſtate of ſecretion in the animals.

Some in the intention of increaſing the quantity of milk have recommended milking, when the cows are fully fed in the ſummer ſeaſon, three times in the courſe of the day at equal diſtances, as the convenience of the buſineſs will admit, as the moſt proper:—Early in the morning, about the middle of the day, and in the evening before it is too late. The exact proportion of increaſe in the milk that may be produced in this way over that of milking in the morning and evening only, which is the uſual mode, has not, that we know of, been aſcertained with any degree of accuracy; but ſome ſuppoſe that it may approach to nearly one-half of the whole, while others contend that it cannot be any thing near ſo much*. If a third were gained, by ſuch means, it would amply repay the cow-keeper for his additional trouble and expenſe.

The method of milking adopted by the cow-farmers in moſt caſes, is only to have their milking performed twice in the courſe of twenty-four hours. In ſuch caſes the moſt proper times would ſeem to be about ſeven o'clock in the morning and five in the afternoon; but in the neighbourhood of London and other large towns it is the practice to have this work performed from four to half paſt ſix in the morning, and from half paſt one to three in the afternoon†. It is, therefore, probable that more frequent milking in the buſineſs of cow-farming, eſpecially when conducted upon any extenſive ſcale, would not only be inconvenient but impracticable. In ſuch caſes all that can be done is, perhaps, that of having the operation executed with as much care as poſſible, in reſpect to the whole of the milk being taken away each time, and by perſons who are careful and perfectly accuſtomed to the work. Where this is neglected, much loſs may be ſuſtained not only in the immediate produce of the milk, but in the cows becoming much more quickly dry, as well as their being more ſubject to affections of the udder. The beſt advice is to have the buſineſs performed in an expeditious manner, in regard to the whole of the animals, and with the utmoſt attention in reſpect to cleanneſs. A ſufficient number of perſons ſhould of courſe be employed in proportion to that of the cows. An expert milker is capable of performing the operation on from ſix to ſeven or eight cows in the courſe of an hour‡.

The profit or advantage of this method of farming muſt vary conſiderably, in pro-

* Anderſon's Recreations, &c. Vol. III. † Corrected Agricultural Report of Middleſex.
‡ Annals of Agriculture, Vol. XXXII.

bortion to the ſituation, in reſpect to the convenience of ſale of the milk, and the facility of providing the animals with ſuitable kinds of food*. It is a method that requires fewer ſervants or attendants than moſt others in proportion to the

* It is obſerved in the Agricultural Survey of Middleſex, that the quantity given by each cow, on an average, is nine quarts a day, equal to, per annum, 3285 quarts. The calf takes part of the milk for the firſt two or three days, during which time it would not be ſaleable; and there is a falling off for a few days before the cow calves: theſe occaſion a deduction of about eighty-five quarts, leaving the annual ſaleable produce of each cow about 3200 quarts, which at the medium price of ſeventeen-pence for eight quarts ſtand thus.

Dr.—*Expenſes of one Cow.*				Cr.—*Produce of one Cow.*			
To turnips, 14 buſhels per week, *s. d.* at 2½d. per buſhel - - - - -	2	11		By milk on an aver. 9 qts. per day, or 3285 quarts per year			
Grains, 7 ditto, at 2¾d. per ditto	1	7¼		Deducting - - - - - - - - -	85		
Hay, 1 truſs and 4-tenths, at 1s. 9d. per truſs - - - - - - -	2	5¼		quarts for loſs before and after calving,			
Et ceteras - - - - - - -		½			3200		
	7	0		At 17d. for 8 quarts	£.28	6	8
7s. per week, or per year	£.18	4	0	By a calf at two or three days old, average	1	3	4
Balance - - - - - -	11	6	0				
	29	10	0		29	10	0

leaving a balance of eleven pounds ſix ſhillings for intereſt of ſtock, loſſes in cattle, the hire or ſupport of horſes and waggons, rent of buildings, attendance and profit.

It is remarked that "the conſumers pay three-pence halfpenny per quart to the retailers. If the latter were to ſell the milk pure and unadulterated at this price, it would yield them a profit of 64l. 14s. per cent. But, in order to diſcover the actual profit of the retailers, we muſt add ſixpence for ſhort meaſure and the extraneous articles mixed with it, which increaſes 2s. 4d., the uſual price of eight quarts, to 2s. 10d.; and, as it coſts them only 1s. 5d., there remains for labour and profit 100 per cent.: thus the retailer clears 28l. 6s. 8d. by every cow.

Near Liverpool, Mr. Harper found the average produce of cows, under an induſtrious manager, to be nine quarts of milk per day the year through; which is ſold at 2d. per quart with the advantage of ſelling cream, but which, from other milk being brought from the country, is reduced in milk and cream to 2d. per quart. The keep and produce therefore ſtand thus:—

Dr.—*Expenſes of one Cow for a Year.*	£.	s.	d.	Cr.—*Produce of one Cow for a Year.*	£.	s.	d.
To average keep of a cow in grains, &c. for one year, at 4s. 6d. per week -	11	14	0	By milk on an average of 9 quarts per day—3285 quarts, at 2d. per quart - - - - - - - - - -	27	7	6
To 160 ſtone of hay, at 8d. per ſtone	5	6	8				
To graſs 16 weeks, at 3s. 6d. per week	2	16	0				
Balance - - - - - - - - - -	7	10	10				
	27	7	6		27	7	6

extent of buſineſs; ſeldom more than four or five men being employed in the attendance of three hundred cows. The expenſe of milking is thrown upon the milk-dealer, who contracts for the produce of a certain number of cows. If this was not the caſe, the expenſe to the cow-keeper would be very high, as one woman cannot milk more than eight or nine cows twice in the day. In country ſituations this may, however, not always be the caſe. The cow-houſes in Middleſex are moſtly provided with milk-rooms, where the milk is meaſured and ſerved out by the cow-farmer*. It has been obſerved, "that of the ſeveral different ways of raiſing a profit from milch cows, that of ſelling the milk, where circumſtances will allow of its being carried on to a due extent, is by far the moſt eligible. In the economy of making butter and cheeſe, the trouble and expenſe are daily and perpetual. Several extraordinary domeſtics muſt be employed where the dairy is large; and no ſmall allowance of fuel is neceſſary, that boiling water may be ſtill at hand, to ſcald the pails and other utenſils employed on the occaſion. In ſuckling, alſo, the charges are much heavier than when the milk is ſold out of the pail; for ſucklers are continually wanted, which are often bought in at very advanced prices, and ſometimes theſe are not to be procured at any rate juſt when they may be required; ſo that either the calves which are ready for the butcher muſt be kept a week or two longer than would otherwiſe have been neceſſary, (in which the farmer will rarely find his account), or, if theſe calves are ſold off, there will be an overplus of milk, of which it will be found difficult to make any profit, ſince it will not produce a quantity of cream ſufficient to make any advantage by the butter. Now the milkman has none of theſe inconveniences to ſtruggle with; and, whilſt the cows continue to yield an ample produce, and this goes off at a quick ſale, the whole of the buſineſs is performed with little trouble; and, what is an additional advantage, each cow yields a profit before her milk is ſent to market by the ſale of the young calf; whereas the ſuckling-farmer, as was mentioned before, is often under the neceſſity of purchaſing ſuch young calves to keep up his ſtock,—a balance greatly in favour of thoſe perſons who make ſale of their milk†."

Suckling of Calves.—This is another method in which the produce of the cow may in particular ſituations be turned to great advantage. It is only, however,

*In the neighbourhood of Leeds, in Yorkſhire, independent of ſtraw or other dry food, they find to maintain a cow for the winter months requires about four pounds worth of brewer's grains, and two pounds worth of graſs for the ſummer months: ſo that the annual expenſe in theſe kinds of food is ſix pounds, and the produce of their cows about ſix to eight quarts of milk per day. In other parts the expenſe of keeping is ſeven pounds per annum, and the produce yields about ten pounds.

* Middleſex Report. † Synopſis of Huſbandry.

in the neighbourhood, or within a certain diſtance, as twenty or thirty miles, of large towns, where the demand for veal is conſtantly great, that the practice can be attempted with ſucceſs. In other circumſtances it is by no means applicable, or to be depended upon by the farmer. Where the paſtures are rich, and ſituated near the ſuckling-houſes, it may be more advantageous than in other caſes*. In this buſineſs, as well as that of cow-keeping, the animals ſhould be well ſuited to the nature and ſupply of food that can be conſtantly commanded. And as in the fattening of calves much depends both on the quality and quantity of the milk, thoſe cows ſhould be choſen for the purpoſe which, while they afford ſuch milk as poſſeſſes rich and highly nutritious properties, may ſupply it in a tolerably large proportion. On theſe accounts the large Holderneſſe breed of cows may often be leſs proper for the calf-ſuckling farmer than thoſe of other breeds that do not afford milk in quite ſo large a proportion, but of ſuperior quality. Where the paſturage, however, is good, and the command of other ſorts of food eaſy at all ſeaſons of the year, the larger breeds may be employed in this way with great profit. It has been adviſed by ſome, as the beſt method of obtaining a ſuitable breed of cows for the ſuckling buſineſs, to wean every year a proper number of calves from the beſt cows, which from their being raiſed where they are to be afterwards kept, and at a cheap rate, muſt be more advantageous than purchaſing them from diſtant diſtricts†.

But whatever the breed of cows may be that are kept for this uſe, they ſhould be conſtantly well fed either by grazing in the paſtures or by being foddered in the ſtalls. It is moſtly the practice to feed them in the autumn, the winter, and ſpring months, while tied up, with brewer's grains, turnips, cabbages, carrots, and various ſorts of green food that are made uſe of for ſoiling cattle; to which a ſuitable proportion of well made green rowen or meadow hay is added; and a full ſupply of pure water twice a day at leaſt.

It is eſſential in this practice, that the ſuckling-houſe be ſpacious and airy, having a range of ties or faſtenings on one ſide for the purpoſe of confining the cows, and on the other a ſet of cribs or pens for containing the calves. Theſe ſhould be ſo contrived, as, while they keep the calves as dry and clean as poſſible, they exclude them from the influence of the light. Some adviſe, in the firſt view, raiſed moveable floors formed of narrow laths or ſpars, nailed upon joiſts, at the diſtance of about an inch from each other, as by this means the moiſture and naſtineſs are not only immediately drained off, but a conſiderable degree of venti-

* Synopſis of Huſbandry. † Ibid.

lation effected*. This method is probably, however, more neceſſary for calves in the ſtate of rearing than thoſe that are fattening for the butcher. In theſe caſes it is moſtly the cuſtom to have only common floors. The pens or diviſions ſhould never be too large; as in this buſineſs the more quiet, and the leſs the calves move about, the better they fatten. And it is of the utmoſt conſequence to have them kept perfectly clean, and free from every ſort of diſagreeable ſmell, as without attention in this reſpect the buſineſs never goes on well. This is beſt effected by frequent ſweeping and cleaning them out, and having recourſe to freſh clean wheat ſtraw for littering them with every day. It is alſo a good practice to have collars made of leather to paſs round the necks of the calves and buckle, as by this means they may be conveniently tied in the pens when neceſſary, and likewiſe be confined in their proper places while ſuckling, by faſtening the lines that are fixed in the ceilings of the houſes, for the purpoſe, to them. Theſe contrivances not only ſave much labour, but prevent that confuſion which would otherwiſe be the caſe. In this management one perſon is ſufficient to the taking care of fifteen or twenty cows†. Some, however, think it better not to tie them in the pens‡.

There are two methods purſued in the fattening of calves; one is by allowing them to ſuck the cows, and the other to give them the milk after it has been drawn from the animals. The firſt is obviouſly the moſt adviſeable practice, and that which is the moſt commonly followed. In this mode the calves are in general only admitted to ſuck twice in the day; but it would probably be more advantageous to let it be done three times, at as equal diſtances as poſſible from each other, as in this way the calves would be leſs liable to have their ſtomachs overloaded, and of courſe be leſs expoſed to danger from ſcouring; and conſequently fatten faſter. In the latter method the milk is given them warm from the cow in the morning and evening, being gradually increaſed as the calves increaſe in ſtrength and ſize. This practice is more troubleſome, and has only the advantage of keeping the cows more quiet.

The length of time which is neceſſary for perfecting the buſineſs of fattening muſt vary according to circumſtances; but in moſt caſes it is from ſix, or ſeven, to eight or nine weeks. Where this is not a regular buſineſs, the fattening is however generally diſpatched in a much ſhorter time.

It has been ſuggeſted, that "as it is neceſſary that the calves ſhould always lie quiet, in order that they may indulge in ſleep at thoſe times when they are not employed in ſucking, the cow-houſe ſhould be ſituated in the moſt retired part

* Section on Farm Buildings. † Annals of Agriculture, Vol. XXXII. ‡ Synopſis of Huſbandry.

of the yard, and the pens ſhould be kept as dark as poſſible. But notwithſtanding this caution, the calves ſhould by no means be ſuffered to lie too hot in the ſummer time; which would be apt to induce a ſickneſs amongſt them. To admit, therefore, an occaſional draught of freſh air, let a window be cut in each pen, with ſhutters adapted to the ſame, and let theſe windows be opened whenever the cloſeneſs of the atmoſphere indicates it to be neceſſary. In the ſummer ſeaſon they ſhould rarely if ever be cloſely ſhut; and when it is required, the ſtream of air may be increaſed by opening the cow-houſe door at the oppoſite end of the building." And it is added, that "as the calves are brought forth they are to be taken into the pens, and ſuckled on their own dams, which at firſt will yield a far greater quantity of milk than is neceſſary for their offspring, ſo that another calf may be ſuckled thereon; or the cow may be milked, and the cream be reſerved for butter, or applied to any other uſe that the owner may think proper. As the calf increaſes in ſize, it will require a larger quantity of milk: but whilſt they are young, one good cow will yield a full ſupply for two calves; and when the whole produce is demanded for one calf, another new milch cow ſhould be provided, and theſe two cows will abundantly ſupply three calves with milk till the oldeſt is fit for the butcher; after which, if neceſſary, a freſh ſuckler may be bought in, and the buſineſs be carried on progreſſively by keeping the houſe conſtantly ſupplied with calves, ſo that the whole milk may be ſucked*." As the buſineſs of calf-ſuckling and dairying can ſeldom or ever be carried on to advantage together, it is always the beſt method to provide ſucklers whenever they are wanted.

In moſt ſituations, within the diſtances that have been ſpecified, the ſuckling-farmers ſupply themſelves with ſucklers from the London markets, as being the moſt convenient places to apply for them, ſo as to be on a certainty, as theſe are "the general receptacles where the milk-men vend their calves; and which having been bred from the larger ſorts of cows generally turn out to good account for the ſuckler; ſuch large-boned calves, when fattened, ariſing to a weight much more conſiderable than the ordinary produce of the country dairy-men: and as to the ſuperior quantity of milk required in fattening the larger breed of calves, this is amply recompenſed by the great increaſe of weight."

As young calves when permitted to ſuck their fill are often ſeized with a looſeneſs or ſcouring; in order to prevent this, for the firſt fortnight or three weeks it is neceſſary to ſtint them in their allowance; but at the ſame time due regard ſhould be had that they do not pine or decreaſe in fleſh for want of milk. After this age they ſhould be allowed to ſuck as long as they chooſe, and every means ought to be made

* Synopſis of Huſbandry.

uſe of to increaſe their appetites, and render them more eager after their food. Chalk may be made uſe of for this purpoſe, as well as for correcting the ſuperabundant acidity in the ſtomach, and leſſening the tendency to ſcour. The idea of its giving to the fleſh a delicate whiteneſs is probably not well founded. Salt ſprinkled in the troughs likewiſe acts as a ſtimulus to the appetite: beſides theſe, it is a common practice with ſome to give their calves balls compoſed of flour, pounded chalk, and milk, with the addition of a ſmall quantity of common gin, and ſometimes a little tincture of opium. Of theſe balls they give two, about the ſize of a walnut, once a day, or oftener, to each calf. Such balls, being very nutritious, in ſome degree ſupply the place of milk, and at the ſame time, from the great ſtimulus which they afford to the young animals, diſpoſe them to ſleep, and thereby increaſe their diſpoſition to fatten: but where milk can be had in ſufficient abundance, it is never worth while to have recourſe to theſe aids. When the demands of the calves, however, are beyond the powers of the cows, theſe balls come ſeaſonably to their relief. Occaſional bleedings have alſo been adviſed, to prevent loathing the food and diſeaſes from plethora*. In order that the calves may be provided with ſufficient ſtore of milk, the paſtures ſhould be changed whenever the cows are found to be deficient in this particular; and in the winter time they ſhould be well fed in the manner directed above.

In this ſyſtem of management it is conſtantly neceſſary to be buying in calves at a week or ten days old, or as they can be procured. The prices vary, according to the goodneſs and the time of year at which they are bought. In general ſucklers fetch the largeſt price in ſummer, when veal ſells the cheapeſt; and the reaſon is, the ſmaller number to be met with at that time than in the ſpring. A good ſuckler can ſeldom be bought for leſs than 20s. and is often ſold for 25s. or 30s. They are kept till they fetch from four or five to ſeven or eight pounds†. The buſineſs of ſuckling was formerly reckoned to turn out to good advantage, when each calf throughout its fattening brought a profit to the farmer of three ſhillings a week; but at preſent the profit on ſuckling is much greater.

The calves that are ſuckled by their own mothers are in general found "to fatten in a ſhorter time than thoſe which are afterwards bought in to ſupply their places: the reaſon of which is, probably, their not having been removed from the place where they were firſt dropped, and having always continued to ſuck the milk moſt natural to them; which muſt be ſuppoſed more nutritious, and to agree better with them, than that of any other cow. Beſides, from the cows having lately calved, the milk nouriſhes and fattens in a higher degree than when they become ſtale milched. Cow calves are obſerved to fatten more kindly than the male or bull calves; and

* Farmer's Magazine, Vol. III. † Synopſis of Huſbandry.

theſe laſt are much more coarſe grained, and their fleſh leſs delicate in taſte, than the former*." In ſome diſtricts, barley-meal, and linſeed boiled into a kind of jelly, and ſuch-like materials, are ſometimes given to calves in the courſe of fattening; but the above methods are greatly ſuperior, though they may be more expenſive.

It is found by experience that the veal of calves when killed at ſix weeks or two months old is ſeldom of ſo good a colour, or does the fleſh of ſuch young calves taſte ſo well, as where the animal is ſuffered to live a few weeks longer. "To attain both theſe ends of colour and flavour, it is ſuppoſed neceſſary that the calves ſhould be maintained with plenty of milk, and regulated under ſuch management as before directed, till they arrive to the age of eight or ten weeks, according to the ſeaſon of the year, the more or leſs kindly ſtate of the calf, the particular demand of the markets, or other circumſtances. In the ſummer ſeaſon it may be proper to diſpoſe of them at an earlier period than in the winter; not only on account of their growing away with greater celerity in warm weather, but likewiſe becauſe of the increaſed demand for ſmall veal, which is then moſt ſaleable. During the laſt three or four weeks, blood ſhould frequently be drawn from the calf, which, it is ſuppoſed, will be a likely means towards rendering the veal of a colour delicately white; a circumſtance ſo much attended to by the butcher, that he will commonly depreciate ſuch calves as from the appearance of their eyes are likely to die *black*, as they term it, though in other reſpects not to be deſpiſed†." It is probable, however, that the colour of the veal depends upon the breed, and is incapable of being altered in this way.

Mr. Marſhall is decidedly of opinion "that to ſuckle calves in general after they are ten weeks old is bad management;" as from the whole of his accounts, "thoſe of nine or ten have paid as much a week as thoſe of twelve or thirteen; and although a calf of ſix weeks old may ſuck nearly as much milk as a calf of twelve weeks old, yet the firſt month or five weeks the quantity is conſiderably leſs, and this advantage of their infancy is doubly as valuable to nine as it is to twelve weeks." The advantage of this practice is very conſiderable when conducted upon a large ſcale. Near the metropolis the groſs product of a cow in this way was, before the late advances in the price of butcher's meat, eſtimated to riſe on the average to ſeven or eight pounds in thoſe of the moderate kind, and in very good ones to nine pounds. The profit at preſent ſtands much higher.

Rearing of Calves.—This is a practice that every farmer who is deſirous of having a good cow ſtock ſhould be careful in attending to, by ſelecting the beſt cow calves from ſuch cows as are the moſt quiet, give the richeſt milk, are the moſt

* Synopſis of Huſbandry. † Ibid.

hardy, and moſt adapted to the comparative goodneſs of the farm,—and rearing them with every poſſible attention. There are different modes of conducting this buſineſs: but the moſt natural and convenient, as well as that which is moſt advantageous to the animals, is permitting them to ſuck for a ſufficient length of time to get into perfect order before they are put to other food, as in this way they become much ſtronger, and more diſpoſed to thrive, than where brought up from the firſt by the hand; and, beſides, the trouble is infinitely leſs. The proper method would therefore ſeem to be, that of letting the calves be ſuckled twice or oftener a day for ſome length of time before they are weaned. But this is a practice that is not by any means general, different diſtricts having particular methods, which they conſider as the beſt.

In Yorkſhire the uſual method is, for the firſt two or three weeks, for them to get milk warm from the cow; but for the next two or three weeks half the new milk is withdrawn, and ſkimmed milk ſubſtituted in its ſtead; and at the end of that period the new milk is wholly withdrawn; they are then fed on ſkimmed milk alone, or ſometimes mixed with water, till they are able to ſupport themſelves by eating graſs or other food of that ſort. They are very ſeldom allowed to ſuck. But in Cheſhire the practice is to allow the calves to ſuck for the firſt three weeks. They are then fed on warm green whey, or ſcalded whey and butter-milk mixed: with the green whey water is frequently mixed, and either oatmeal or wheat and bean flour added. A quart of meal or flour is thought ſufficient to mix with forty or fifty quarts of liquid. Oatmeal gruel and butter-milk, with an addition of ſkimmed milk, are alſo uſed for the ſame purpoſe. Some one of theſe prepared kinds of food is given night and morning for a few weeks after the calves are put on that diet, but afterwards only once a day, till they are three months old or more. Calves in Glouceſterſhire are not allowed to ſuck above two or three days; they are then fed on ſkimmed milk, which is previouſly heated over the fire. When they arrive at ſuch an age as to be able to eat a little, they are allowed ſplit beans or oats and cut hay, and water is mixed with the milk. And the Suſſex method is ſtill materially different from any of theſe. It is common there to allow the calves either to ſuck for ten or twelve weeks, or to wean them at the end of three or four, and to give them a liberal allowance of ſkimmed milk for ſix or eight weeks longer. It is the cuſtom in Suffolk to let the calves ſuck ſix or ſeven weeks, and then to give them coarſe pollard and oats with ſkimmed milk and water, letting them have ſome nice green hay conſtantly till they are turned to graſs. Carrots might likewiſe be uſed with advantage as a ſubſtitute for the oats. In

Norfolk, with early calves, the method is for them to ſuck twice a day for a fortnight, then to have the pail twice a day for an equal length of time, afterwards once a day for a month or ſix weeks longer; cut hay, turnips, and ſometimes other materials being put in the racks and mangers. The latter is an excellent food where they take well to it, as they require but little water with them. With this combination of milk and turnips the calves are generally found to thrive extremely well.

In Scotland they have two methods for rearing calves: the firſt is by giving them a pailful, containing about a gallon, of milk warm from the teat of the cow, morning and evening, for eight or ten weeks; and the ſecond is to allow the calf to ſuck its dam.

Where calves are reared with ſkim-milk, it ſhould be boiled, and ſuffered to ſtand until it cools to the temperature of that given by the cow, or a trifling degree more warm, and in that ſtate be given to the calf. Milk is frequently given to calves when made warm only; but that method will not ſucceed ſo well as boiling it. If the milk be given over cold, it is apt to cauſe the calf to *ſkit* or purge. When this is the caſe a little rennet may be put in the milk. If, on the contrary, the calf is bound, bacon or mutton broth is a very good and ſafe thing to put into the milk. From a gallon to a gallon and a half of milk per day will keep a calf well till it be thirteen weeks old. It may then be ſupported without milk, by giving it hay and a little wheat-bran once a day, with about a pint of oats. The oats will be found of great ſervice as ſoon as the calf is capable of eating them. The bran and oats ſhould be given about mid-day: the milk in equal portions, at eight o'clock in the morning and four in the afternoon. But whatever hours are choſen to be ſet apart for feeding the calf, it is beſt to adhere to the particular times, as regularity is of more conſequence than is commonly ſuppoſed. If calves go but an hour or two beyond their uſual time of feeding, they find themſelves uneaſy, and pine for food. It is always to be underſtood, that calves reared in this manner are to be enticed to eat hay as early as poſſible; and the beſt way of doing this is to give them the ſweeteſt hay that can be procured, and but a little at a time. Turnips or potatoes are very good food as ſoon as they can eat them; and they are beſt cut ſmall and mixed with the hay, oats, bran, and other ſimilar ſubſtances.

There is another mode that may ſometimes be adopted, which is that of ſacrificing the milk for the benefit of the calves, by letting one or more run with the cows in full milk till they are capable of providing for themſelves; but this is a method that has been objected to, as not letting the cows take the bull; which is probably a miſtake. The more rapid growth of the calves, and the great convenience of the method, are however greatly in its favour.

When the calf is ſuffered to ſuck the mother, it ſhould have the firſt of the milk, the reſt being afterwards milked. It will thus have the thinneſt part, which is the leaſt liable to injure it by producing a ſcouring. As calves are frequently ſubject to be affected with looſeneſs from a ſort of indigeſtion being produced in their ſtomachs, which, when it proceeds to any great length, is termed the *ſkit*; great care ſhould be taken, eſpecially where they ſuck ſtale milched cows, or when taken from ſucking and put upon other food, to guard againſt this effect; which may in moſt caſes be accompliſhed by not letting them have too much at once, and gradually accuſtoming them to the change. When this effect riſes to the ſtate of diſeaſe, the beſt remedy is probably that of boiling pounded chalk, in the proportion of half a pound or more to four quarts of water, adding a couple of ounces of the ſhavings of hartſhorn, with a quarter of an ounce of bruiſed caſſia, for a few minutes, and then ſtraining off the liquid, which may be given with the milk or other food, ſuitably warm, to the quantity of from half a pint to a pint, once or twice a day, according to circumſtances. In theſe caſes the calves ſhould always be kept dry and warm under ſhelter from wet. If other materials be neceſſary to be mixed with the milk, wheaten flour will probably be found the beſt.

Weaning of Calves.—It is better in general to wean early than late, as calves that are weaned late in the ſeaſon ſeldom riſe to any great ſize. In January, or February, and till the beginning of March, may anſwer very well, but, except where the largeneſs of growth is of no conſequence, it ſhould not be attempted later: however, under ſuch circumſtances it may be continued till the early part of May. The beſt mode of doing this is to let the calves have new milk at the beginning, afterwards a mixture of new and ſkimmed milk, then ſimply ſkimmed milk, and ultimately a mixture of water and ſkimmed milk with a little barley or oat meal, or flour ſtirred into it. A ſmall lock of ſweet hay is alſo to be kept tied up within their reach, to induce them to eat that ſort of food as ſoon as poſſible. The calves are ſooneſt learned to drink their milk or other liquid food by the dairy-maid putting her finger in the pail that contains theſe ſubſtances while they are feeding. When they are once taught in this way to drink, no further trouble will be neceſſary.

It is not abſolutely neceſſary to continue the giving of milk after the calves are a month or ſix weeks old; but they are certainly the better for it when it can be done.

From the increaſing ſcarcity of milk, great attention has lately been beſtowed in diſcovering ſubſtitutes that may anſwer the purpoſe without that valuable food, as by ſuch means a greater number of calves might be reared; which would be of vaſt

importance to the farmer, as well as in other points of view. Various experiments have been inſtituted in this intention, but without any very complete ſucceſs. It has been adviſed by Mr. Varlo to have recourſe to a ſtrong infuſion of hay, made by pouring boiling water on good freſh hay, covering the veſſel up cloſely during the operation, and letting it remain till the virtues are fully extracted; with the proportion of one pint of oatmeal, the ſame quantity of flax-ſeed, and a quart of ſkimmed milk; the flax-ſeed being bruiſed and put in with the hay, and the meal and milk added afterwards to the clear infuſion *. In this way, it is contended that a buſhel of flax-ſeed, worth about three ſhillings, will be ſufficient for rearing two calves. A ſimilar method has been attended with ſucceſs for young calves that have been kept with milk in Lincolnſhire; but in this caſe the bruiſed flax-ſeed is boiled to a kind of jelly of light conſiſtence, which, after being ſufficiently diluted with warm water, is then rendered of the thickneſs of cream by barley meal being ſtirred in. When a great number of calves are to be reared, and the ſupply of milk is inadequate, by being uſed in combination with this compoſition it may be made to ſupport nearly twice the number of calves †. The advantage that may be derived in this way has not however been fully aſcertained by accurate experiments. A method recommended by the Duke of Northumberland was found to ſucceed well in his trials, and thoſe of others ſince. It is by preparing ſkimmed milk with other ingredients, ſo as to anſwer the purpoſe where new milk is given, at about one-third the expenſe. The ſubſtances that are made uſe of are treacle and linſeed-oil cake, reduced by the operation of grinding to the ſtate of almoſt an impalpable powder; being employed in ſuch ſlight proportions as, excluſive of the milk, to come to no more than about ſixpence for thirty-two gallons. The manner of preparing it is this: "Take one gallon of ſkimmed milk, and to about a pint of it add half an ounce of common treacle, ſtirring it until it is well mixed; then to take one ounce of linſeed-oil cake, finely pulverized, and with the hand let it fall gradually, in very ſmall quantities, into the milk, ſtirring it, in the mean time, with a ſpoon or ladle, until it be thoroughly incorporated; then let the mixture be put into the other part of the milk, and the whole be made nearly as warm as new milk when it is firſt taken from the cow." In this ſtate it is fit for uſe. "After a time the quantity of oil-cake powder may beincreaſed." This ſhould be done as occaſion may require, and as the calves become inured to the flavour of ſuch food.

Mr. Crook has been in the habit of weaning calves with ſucceſs without any milk,

* New Syſtem of Huſbandry, Vol. III. † Annals of Agriculture, Vol. XXIII.

by making a jelly of one quart of linſeed boiled ten minutes in ſix quarts of water, which jelly is afterwards mixed with a ſmall quantity of the beſt hay-tea.

It ſeems not improbable, from the trials which we have made, that potatoe-meal may be uſed this way with benefit, as it mixes well with either milk, water, or weak broth, and is highly nutritious. By this means the great expenſe of oats, meal, and other ſimilar ſubſtances may be avoided. There are many other ſubſtances that might prove uſeful in this intention, if proper trials were made with them.

In regard to the period of caſtrating or gelding the calves, it is probably the beſt to perform the operation pretty ſoon after the calves have been dropped, as there will be leſs danger from bleeding, and of their taking on too much inflammation, at that period than afterwards, when they have attained a greater degree of health and vigour Some adviſe three weeks or a month, but a week or a fortnight at moſt is perhaps much better. In the male calves, the cutter, when expert, after dividing the ſcrotum, or bag, and ſeparating the teſticles, draws out the ſpermatic veſſels, by introducing his fore-finger and thumb. It is probable, however, that ſimple exciſion may be equally effectual, and muſt always be leſs hazardous. The *ſpaying* of the female calves, which is frequently performed, is an operation of greater nicety, and requires more dexterity in its management. Such calves as have been ſpayed are found from experience to be more quiet in the paſtures, and afterwards to fatten more expeditiouſly.

Much care and attention is neceſſary, eſpecially in the more early weaned calves, to keep them perfectly dry and warm, as their thriving will in a great meaſure depend upon this being effectually done. The ſubſtances, of whatever kind they may be, ſhould be left off in as gradual a manner as poſſible, as the calves become incapable of ſupporting themſelves on hay or graſs. The following advice of a practical writer * is judicious: After the calves have been weaned, eſpecially the later ones, they ſhould be turned abroad, in the day-time, into a ſmall cloſe or orchard near the farm yard, where there is a good bite of graſs; and, as there is generally more than one calf weaned in a ſeaſon, they will each be company for the other, and become in a ſhort time reconciled to their ſituation. This paſture ſhould be at ſome diſtance from that whereon the dams are turned, and have neither ponds or ditches, or any annoyance which may endanger the lives of theſe youthful animals; and in order to habituate them ſtill more to their paſture, the food ſhould be carried clean to them at each of their feeding-hours. For the firſt month or ſix weeks, they ought every night to be brought out of the meadow, and lodged in the pens; but,

* Mr. Banniſter.

after this time they may be left in the paſture as well in the night ſeaſon as in the day: and their food may now be lowered by degrees, till it be at length reduced to ſimple water only; for, when the calves get to the age of twelve or fourteen weeks, they will no longer require the aid of this ſuſtenance, but be able to ſatisfy their appetites by graſs. Care, however, muſt be taken throughout the ſummer that they be frequently ſhifted from one paſture to another, in order that they may be kept up in good fleſh, and enabled to grow away with the utmoſt celerity. At Michaelmas, or ſoon after, they ſhould be taken into the yard; and if they were allowed the indulgence of a ſmall cloſe to themſelves it would be ſtill better. And here their taſte muſt be gratified with the beſt and ſweeteſt hay that can be procured, with an outlet on a dry paſture, where in fine open weather they may be ſuffered to enjoy themſelves: it would redound greatly to their advantage, if, on the approach of winter, a ſhed was to be erected for them to repoſe in during the night, and for ſhelter in tempeſtuous days. So eſſential are warmth and good living to young animals of every denomination, that the care which has been taken of them in their early life will be manifeſt in every ſtage of their future growth. Nor is there any ſtock which will pay better for this cautious management in their youth than thoſe of the cow kind; for if theſe are ſtinted in their feed, or careleſsly attended whilſt in their growing ſtate, they will never arrive to that ſize which they would otherwiſe have done, and conſequently the loſs will be perpetually felt by the farmer who attempts to raiſe milch cows of his own breed without giving them a due attendance in the firſt year*.

It is added by the ſameaut hor, that "when calves have attained their firſt year they are called *buds* or *yearlings*; and though at this time they may be able to mix with the herd, yet it would be moſt prudent, if not attended with too great an inconvenience, to ſuffer them to remain in a paſture by themſelves. But if this cannot be done, let them be turned out with the dry ſtock, and not permitted to run with the cows, as this might probably be the cauſe of their taking the bull—a meaſure which ſhould at this age be cautiouſly guarded againſt, as ſuch *buds* as propagate at this early age moſtly receive a check in their growth on this account: and if, during the ſucceeding winter, they were to be managed as before directed, their future growth would be found to pay ample intereſt for the fodder that is now given them: only this is to be obſerved, that as their ſtrength is now conſiderably augmented, a leſs valuable fodder may ſuffice, and good pea ſtraw may ſupply the place of hay.

* Synopſis of Huſbandry.

Such farmers as have low ruſhy meadows, where there is frequently a length of old graſs in the winter, may, in this ſecond year, turn the calves into them, as they will meet with plenty of nouriſhing food, whilſt the weather is fair and open."

At two years old ſome ſuffer heifers to take the bull, and think it the beſt method; but others ſuppoſe it a better practice for the cows, and more to the intereſt of the farmer, to wait a year longer before they are put to the males, as they will make much better cows by ſuch a delay.

It is in all caſes by much the beſt practice to feed the young cattle ſtock both the firſt and ſecond year, eſpecially in the winter ſeaſon, as well as poſſible,—as, when the contrary method is adopted, their growth is ſo reſtricted that they can afterwards ſcarcely be brought into a proper ſtate of thriving by the beſt food: ſuch as turnips; hay, with root food, carrots, and potatoes, may be the moſt beneficial in the ſecond winter, great care being taken to keep them clean by proper littering. When ſtraw is the common food, ſuch roots ſhould be employed in a larger proportion. The two-year old cattle, whether of the male or female kind, ſhould be fed with hay or good ſtraw, according as they can be more conveniently afforded, interpoſing feeds of turnips, cabbages, or other ſimilar ſorts of food. In general it may be a good rule to keep cattle of the ſame age and kind as much together as circumſtances will permit; as by ſuch means they feed better, are leſs liable to accidents, and are capable of being fed more properly, as they moſtly require the leaſt feeding while young.

Dairying.—There are ſome ſorts of graſs lands that anſwer better in this management than others. It is not well decided, though general experience ſeems to favour the opinion, that the very fertile paſture lands may be more profitably applied to the purpoſe of grazing or fattening animals than that of dairying; but ſuch as are not capable of bringing the larger ſorts of cattle to a complete ſtate of fatneſs, and which uſually let from twenty to five-and-twenty ſhillings the acre, may be more profitably employed in this way. And moſt of the low and more moiſt kinds of meadow lands, which though the value may be high, as they do not ſucceed ſo well for the purpoſe of fattening, may be found highly uſeful for the dairy. The high, open, and expoſed uplands are always leſs proper for this ſort of practice than thoſe which are ſituated lower, are more incloſed and warm.

In the management of the buſineſs, the nature of the paſtures and other ſorts of food which the farmer has at command, muſt direct him in the extent and kind of dairying which he is to purſue.

Where the graſs lands are of the older kinds, and tolerably rich and fertile, butter ſhould probably, in general, be the principal object; but where they have been

more recently converted to the ſtate of ſward, and are of a more cool as well as leſs rich quality, cheeſe may be the moſt depended upon. It is perhaps only under particular circumſtances and ſituations that the different methods can be combined with profit and convenience. There are, however, caſes in which this may be attempted with great advantage.

It has been an obſervation in dairying, founded upon long experience, that ſuch lands as have been for a great length of time in the ſtate of paſture afford milk that abounds more in the oily material, or cream; while thoſe which have been a leſs time in that ſtate, and are of a more cold nature, are more productive in ſuch milk as has the caſeous matter in a large proportion to that of the cream *.

In Yorkſhire the dairy-farmers are in many caſes in the habit of preſerving their old paſtures in their original ſtate, as they find the milk produced on them churns with more facility, and the butter is capable of being kept better than if ſuch naturally rich grounds were highly improved. In ſome caſes it has been found that there was great difficulty in making as well as preſerving the butter, eſpecially in the more warm months, where the land had been wholly ploughed up and improved by manure, particularly of the calcareous kind, where there was previouſly no difficulty of that ſort, and the butter was of the beſt ſort †.

Old paſtures have therefore, beſides the property of ſupplying the butyraceous material in greater abundance, that of rendering the butter more firm and waxy.

It has likewiſe been obſerved that the richneſs of the butter in the Highlands of Scotland has been univerſally attributed to the cows feeding upon the old graſs in their remote glens; though it is ſuggeſted that this may partly depend on the management that is adopted in making it ‡. In Cheſhire they find that the inferior ſorts of paſture lands are the beſt ſuited for cheeſe ‖.

But though this may in ſome degree be the caſe, there cannot be any doubt but that good butter may be made in many inſtances where the cows are kept in new paſtures, and that excellent cheeſe may alſo be prepared where the lands that are employed as paſtures have been long in the ſtate of herbage. Butter equally rich and good with that made while the cows were grazed on the rich old paſtures, has indeed been known to be ſometimes prepared when they were fed with cut clover and dry graſs in the ſtall §.

In commencing this ſort of buſineſs, the farmer is therefore, as has been juſt ob-

* Marſhall's Midland Counties. † Corrected Report of the Weſt Riding of Yorkſhire.
‡ Anderſon in Bath Papers, Vol. V. ‖ Young's Six Months Tour, Vol. III. § Ibid.

ſerved, to determine, from the nature of his land, the ſituation and other circumſtances, which ſort of dairy management it may be the moſt proper and advantageous for him to adopt, whether that of the cheeſe or butter kind. It has not been ſhown by any ſet of experiments that can be fully depended upon, whether the butter or cheeſe dairy affords the largeſt profit to the farmer, when conducted under equally good management. The moſt valuable part of the milk is in each caſe converted into a ſubſtance of great utility; and though the former ſells for a conſiderably higher price than the latter, from the differences in the quantity of the products, in the expenſe and trouble of management, and various other circumſtances, it ſeems that the real advantages are nearly equal. It has been ſtated, before the late riſe in the prices of theſe different articles, to amount, whether of butter and butter-milk, or of cheeſe and whey, to nearly fourpence-halfpenny for each gallon of milk*; at preſent, perhaps, little leſs than from ſixpence to ſixpence-halfpenny.

In the vicinity of large towns, and wherever butter is conſtantly in great demand, it may however be more profitable to have a butter dairy inſtead of that of the cheeſe kind.

It is obvious that much of the profit in this ſort of management muſt conſtantly depend upon the care and aſſiduity that is beſtowed in conducting the different proceſſes of the buſineſs. And it has been obſerved that this kind of management ſhould only be undertaken by thoſe who are capable of paying the moſt minute attention to every department of it; as, unleſs this becomes a fixed and eſtabliſhed principle in the farmer's mind, the chance of ſucceſs is precarious and uncertain. To truſt wholly to common ſervants, in this ſort of buſineſs, is always hazardous, and never to be practiſed where it is carried on to any extent.

The firſt thing that is neceſſary is that of being provided with a ſufficiently large and convenient dairy-houſe, whether the object be cheeſe or butter. It ſhould be ſo proportioned to the number of cows, as that there may be ſufficient convenience for performing all the neceſſary operations without embarraſſment; and much attention muſt be paid to cleanlineſs in every thing that relates to it, ſuch as the ſhelves, floors, and different implements which are made uſe of, by daily ſcalding, ſcrubbing, rinſing, and drying, in order to prevent any ſort of acidity taking place, as, without due regard in theſe reſpects, it is impoſſible that the produce can be of ſuperior quality, or ſuch as will keep ſweet and good for any length of time, &c. Cleanlineſs may indeed be ſaid not only to be neceſſary in dairy-huſbandry, but to

* Corrected Agricultural Report of Mid-Lothian.

be the foundation of it, and the moſt eſſential and leaſt indiſpenſable part of good management. It is obſerved that "a farmer may be in poſſeſſion of the moſt valuable breed of cows, and theſe be fed on the richeſt paſtures; but unleſs cleanlineſs prevail in the dairy, his butter or his cheeſe will never ſtand high in general eſtimation." Next to the ſize and ſituation of the dairy-houſe, and to keeping it and the utenſils clean, is that of ſkill and attention in the general management. In ſhort, without a knowledge of the beſt modes proper to be adopted under different circumſtances, and a regularity, method, and prompt attention to their execution, it is obvious that the buſineſs muſt ſoon run into confuſion, and become unprofitable.

The neceſſary apparatus, ſuch as churns, milk-pails, cheeſe-cloths, trays or pans, braſs milk-kettle and boiling copper, &c. excluſive of the cheeſe-preſs, for a dairy of twenty cows, will coſt about fifty pounds. For fuel either coal or wood will anſwer, but faggots preſerved in the ſtack one year are the beſt *.

The next circumſtance is that of providing cows of the moſt proper kinds, according to the method of dairying that may be practiſed. It has been found by long experience, that ſome kinds of cows give milk of a much thicker conſiſtence and richer quality than others; and that this richneſs of quality is not neceſſarily connected with the ſmallneſs of the quantity yielded by thoſe of nearly an equal ſize; it is therefore of conſequence to the owner of a dairy to be peculiarly attentive to this circumſtance. In chooſing cows for the purpoſe of butter, it ought rather to be the quantity and the quality of the cream produced from the milk in a given time, than the quantity of the milk itſelf, that ought to be regarded:—this is a circumſtance of more importance than is generally ſuppoſed; but where cheeſe is the object of the dairy, quantity of milk as well as goodneſs ſhould probably be attended to. As there are cows in every diſtrict to be found, by a careful ſelection, that afford much thicker milk than others, theſe ought to be ſearched for with care, and their breed reared with attention, as being peculiarly valuable.

In comparing the milk of two cows in order to judge of their reſpective qualities, particular attention ſhould be paid to the time that has elapſed ſince their calving; as the milk of the ſame cow is always thinner ſoon after calving than it is afterwards, as it gradually becomes thicker, though generally leſs in quantity, in proportion to the time the cow has calved. The colour of the milk, however, ſoon after calving is richer than it afterwards becomes; but this, eſpecially for the firſt two weeks, is a faulty colour that ought not to be regarded†.

* Annals of Agriculture, Vol. XXXII. † Anderſon in Bath Papers.

On the richer and more fertile paſtures it is probable that the large and middle breeds of cows may be the moſt beneficial, eſpecially where both cheeſe and butter are made; but in ſuch as do not poſſeſs ſuch a high degree of fertility, the middle and ſmaller breeds may prove more profitable to the dairy farmer. Some ſuppoſe the long-horned breed not well ſuited for the dairy; but experiments that have been carefully made ſhow, that more cheeſe may be produced from the ſame quantity of milk in that breed than in thoſe of the ſhort-horned, as well as more butter from the ſame quantity of cream*. And in Ireland the Craven breed afforded more butter than the Holderneſſe†. Of the ſmaller breeds, the Alderney, the Suffolk polled, and the Kiloe or Scotch breeds, may be found the moſt profitable. In the dairies of the Iſle of Wight, as well as thoſe of ſome parts of Hampſhire, the Alderneys prevail much, and are highly eſteemed for butter. Two-thirds of the Suffolk polled breed, and one-third Alderney, have been recommended as conſtituting an excellent dairy, the milk being mixed‡.

But beſides the milk there is another object to be attended to in forming a cow ſtock, which is, that they be ſufficiently hardy for the ſituation. In this reſpect the long-horned breed is much ſuperior to the ſhort-horned cattle, from the difference in the thickneſs of their hides; and the Scotch is probably better than either. This breed and the long-horned are therefore the moſt proper for bleak, expoſed ſituations.

As many of the mixed breeds afford excellent milkers, and in moſt of the genuine breeds there are great differences in the individuals, it may be the beſt mode, in order to eſtabliſh a good dairy, whether for cheeſe or butter, for the farmer to breed from ſuch cows, of whatever kind they may be, as he has found from experience the beſt for the purpoſe, without being at the trouble of purchaſing the more expenſive breeds. In this caſe good bulls ſhould always be procured, as much is ſuppoſed to depend on the male.

In order to produce abundance of milk, and of a good quality, cows muſt at all times have plenty of food. Graſs is the beſt food for this purpoſe, and that kind of graſs which ſprings ſpontaneouſly on rich dry ſoils is the beſt of all‖.

In the winter keeping of the cows, there are different methods in uſe; but in the ſouthern parts of the iſland they do extremely well in warm ſheltered yards, with open ſheds, eſpecially when plenty of litter, ſuch as ſtraw, ſtubble, fern, or other ſimilar materials can be afforded for keeping the whole well bedded. In the

* Young's Six Months Tour, Vol. II. † Iriſh Tour, Vol. I.
‡ Annals of Agriculture, Vol. XXXII. ‖ Anderſon in Bath Papers.

northern diſtricts, however, and wherever a proper ſupply of litter cannot be obtained, it is better to have them tied up in ſtalls, with raiſed ſtandings, and ſunk paved floors immediately behind them for receiving the dung and urine, as by theſe contrivances they may be kept perfectly clean without litter, and at the ſame time be more warm, as two cows may be confined in the ſame ſtall. The ſtalls ſhould be kept conſtantly clean and well ſweeped out.

In the management of the cows, it has been obſerved that, "if the temperature of the climate be ſuch as to permit the cows to graze at eaſe throughout the day, they ſhould be ſuffered to range on ſuch paſtures at freedom; but, if the cows are ſo much incommoded by the heat as to be prevented from eating through the day, they ought in that caſe to be taken into cool ſheds for protection; where, after allowing them a proper time to ruminate, they ſhould be ſupplied with abundance of green food freſh cut for the purpoſe, and given to them frequently, in ſmall quantities, freſh and freſh, ſo as to induce them to eat it with pleaſure. When the heat of the day is over, and they can remain abroad with eaſe, they may be again turned into the paſture, where they ſhould be allowed to range with freedom all night during the mild weather of ſummer."

Cows are in general only milked twice a day; but, when "abundantly fed, they ſhould probably be milked three times a day during the whole of the ſummer ſeaſon: in the morning early, at noon, and in the evening juſt before night-fall. For, if they be milked only twice in the twenty-four hours, while they have abundance of ſucculent food, they will, as has been obſerved, yield a much ſmaller quantity of milk in the ſame time, than if they were milked three times.

"In the choice of perſons for milking the cows, great caution ſhould likewiſe be employed: for, if that operation be not careſully and properly performed, the quantity of the produce of the dairy will be greatly diminiſhed. It ſhould be a rule never to allow this important department to be entruſted without control to the management of any but very truſty ſervants; as the cows ſhould always be treated with great gentleneſs."

It has been obſerved to be of great conſequence to the produce of a dairy, that the cows ſhould not drop their calves too early in the ſeaſon. When that happens, they fall off in the quantity of milk in the autumn, when, owing to its ſuperior richneſs, it is more valuable than at any other period. From the end of March to the end of April is the beſt time in the more northern diſtricts that a cow can drop her calf, as ſhe ſoon gets into good condition on the early graſs, and yields a greater quantity of milk in the courſe of the ſeaſon than thoſe that calve either conſiderably

earlier or later. But in the ſouthern parts of the iſland it is an advantage for them to calve much earlier.

In the management of cows in ſummer, there is a ſameneſs in almoſt every diſtrict. They are uſually kept on the oldeſt paſtures on the farm: when theſe are at a diſtance from the farm-houſe, they are milked on the paſtures; but otherwiſe they are brought home morning and evening for that purpoſe.

In winter the dry cows, that is, ſuch as do not give milk, are fed on ſtraw in the ſtraw-yard; while thoſe that are in milk, or are near calving, are kept in ſome incloſed paſture, or in ſheds erected for the purpoſe, and maintained chiefly on hay. Where artificial graſſes, turnips, cabbages, or potatoes, are cultivated on a large ſcale, the milch cows have a daily and regular allowance of one or other of theſe ſorts of food during the winter and ſpring months. Potatoes in particular are admirable food for cows; as, while they tend to keep them in good condition, the quantity of milk is generally abundant and of good quality, both in reſpect to richneſs and flavour. In ſhort, the dairy-farmer, in every part of the iſland, will find it for his intereſt to be attentive in feeding his cows*.

Theſe different ſorts of food may be diſtributed for ſummer and winter in this manner:

In ſummer *red clover, ſainfoin, lucern, burnet, and tares* may be made uſe of with great advantage. But in employing the firſt, great care ſhould be taken to guard againſt injury either to the animals, or the quality of the butter or cheeſe being rendered of a bad kind or flavour by it. On poor chalky hills the ſecond will be of the greateſt importance to the dairy-farmer. Lucern and tares ſhould always be employed in the way of ſoiling; in which method, where the cows have proper ſhade and ſufficient water, they will be found of the utmoſt uſe, as they afford a very certain ſupply of food and go a great way. Beſides, the cows are found to milk well in this management where proper attention is beſtowed in the foddering of them. Some ſuppoſe it a method that can hardly be too ſtrongly adviſed†. In Mr. Baker's experiments, a middle-ſized cow was found to conſume in the proportion of from 90 to 100 pounds of green lucern in the courſe of twenty-four hours.

For winter, *hay, ſtraw, cabbages, turnips, carrots, potatoes, cole, malt-grains,* &c. may be made uſe of. The keeping cows with hay is in general too expenſive to afford the dairy-man an adequate profit: therefore, in order to leſſen the expenſe of this ſort of keep, other articles of the green and root kind muſt be had recourſe to: till near the

* Modern Agriculture, Vol. III. † Annals of Agriculture, Vol. XXXII.

period of calving they may be ſupported on freſh threſhed ſtraw in cribs in the fold-yard, beginning with the worſt and gradually proceeding to that which is of a better quality. Thoſe in good condition ſhould have the worſt ſtraw; but when it is not of the beſt kind, and the cows are of a valuable ſort, they may be fed once a day with cabbages, turnips, or other ſimilar ſorts of food, in bins for the purpoſe. When within about a month or ſix weeks of calving, a little hay ſhould be given at night, or the allowance of green food increaſed, and on the day of calving they ſhould be confined, and have warm water; and for a fortnight after calving be very well fed with both hay and green food, in ſuitable diviſions for the purpoſe. In this view the cabbages are extremely valuable, as the produce on the acre is large, and they afford much milk; but care muſt be taken to pick off all the dead and decayed leaves, which may be given to the young ſtock. A middle-ſized cow will conſume from one to two hundred pounds in a day, but ſeventy is ſuppoſed as much with ſtraw as can be paid for by the produce *. In Mr. Dodſworth's trials, a cow of fifty ſtone was found to eat twelve ſtone of this ſort of food in the ſame time. An extent of this kind of crop proportioned to the dairy ſhould always be provided †. The only objection to turnips as food for milch cows is their impairing the flavour of the butter: but they are a ſort of food that affords much milk; and without this, or the preceding green food, a large dairy cannot perhaps be ſupported to much profit. A larger weight of this food than the former is conſumed in the ſame time ‡.

Carrots and potatoes are very advantageous ſorts of food for cows where they are raiſed in great abundance; but even in ſuch caſes they can only be made uſe of with profit as a feed once or twice in a day with other ſorts of food. It is out of the queſtion that a cow could pay for being kept wholly on them. Cole, as being fed off in the field, can only be had recourſe to on the firm dry ſoils; but in ſuch ſituations it is a very profitable crop applied in this way, eſpecially when uſed in ſucceſſion to turnips in the ſpring months §. Malt-grains, where they can be had in plenty, are uſeful with other ſorts of food, as producing a large proportion of thin milk. They are conſequently better for the purpoſes of the milkman than the dairy-farmer.

Whatever kinds of green or ſucculent food may be uſed in the way of feeding dairy cows, experience has ſhown that great advantage may be derived from varying it as much as poſſible ||, probably on the phyſiological principle that the

* Annals of Agriculture, Vol. XXXII. † Young's Six Months Tour, Vol. II. ‡ Ibid.
§ Ibid. || Wedge's Agricultural Report of Cheſhire, 4to, p. 59.

novelty of ſtimulus is the moſt powerful in exciting the action and promoting the ſecretions of the ſyſtem. The uſe of day and night paſtures, which is a method employed in ſome diſtricts, may alſo partly depend on this principle, and partly on that of better ſhade and water*.

In the ſtocking of paſtures with cows, it ſhould always be done according to their goodneſs: ſuch graſs lands as afford in rent, tythe, and taxes, twenty-ſeven or eight ſhillings may ſupport during the ſummer ſeaſon in the proportion of a cow of fifty ſtones to an acre and a half with a few ſheep. But in ſuch as are not worth more than twenty ſhillings, one cow to two acres may be often fully ſufficient.

In this management the rule ſhould be for the paſtures never to be too cloſely ſtocked.

In regard to the labour neceſſary in the management of dairy buſineſs, it will of courſe be different according to the difference of convenience and other circumſtances; but a common dairy-maid can ſeldom manage more than twelve or fourteen cows in a perfect manner, eſpecially where both butter and cheeſe are made. If ſhe undertake more, ſhe will require aſſiſtance in the dairy.

As the cows ſhould not be more than an hour in milking, the maid cannot milk more than five or ſix; in a dairy of about eighteen cows, two aſſiſtants will conſequently be required at ſuch times; which in ſummer, when two milkings only are practiſed, ſhould be at five o'clock in the morning and ſix at night. The work of the dairy muſt therefore be regulated in this proportion.

It is a good practice for the dairy-maid to conſtantly examine the cows ſeparately after the milkers, eſpecially when they cannot be fully depended upon; to ſee that the buſineſs has been perfectly performed; as, where the contrary is the caſe, loſs may not only be ſuſtained in the richeſt part of the milk †, but the cows be more ſubjected to diſeaſe.

* Wedge's Agricultural Report of Cheſhire, 4to, p. 59.

† The following facts ſtated by Dr. Anderſon as the reſult of accurate experiments, in reſpect to the nature of milk and the proportion and ſeparation of cream from it, are deſerving of the particular attention of the dairy-farmer. It was found firſt, that of the milk that is drawn from any cow at one time, that which comes off at the firſt is always thinner, and of a much worſe quality, than that which comes afterwards; and that the richneſs goes on, continually increaſing, to the very laſt drop that can be drawn at that time.—Few perſons are ignorant that the milk which is taken from the cow laſt of all at milking is richer than the other parts of it; but very few are aware of the greatneſs of the diſproportion between the quality of the firſt and the laſt drawn milk from the ſame cow at one milking. The following facts in reſpect to this circumſtance were aſcertained many years ago, and have been confirmed by ſubſequent experiments and obſervations. Having taken ſeveral large tea-cups, exactly ſimilar in ſize and ſhape, and filled them at regular intervals, the laſt being filled with the dregs of the milk; theſe

Management of the Milk.—The proper care of the milk, which is the next circumſtance to be attended to, is of the greateſt importance to the ſucceſs of the dairy. After being brought from the cows, it ſhould be paſſed through a ſieve or ſtrainer of hair or

were each weighed, ſo as to aſcertain that the quantity of milk in each was preciſely the ſame. From a great number of experiments, frequently repeated with many different cows, the reſult was in all caſes thus:—The quantity of milk obtained from the firſt-drawn cup, in every caſe, was much ſmaller than from that which was laſt drawn; and thoſe between afforded leſs or more as they were nearer the beginning or the end. It is unneceſſary to ſpecify intermediate proportions; but the quantity of cream obtained from the laſt-drawn cup, from ſome cows, exceeded that from the firſt in the proportion of 16 to 1. In other cows, however, and in particular circumſtances, the diſproportion was not quite ſo great; but in no caſe did it fall ſhort of the rate of 8 to 1. Probably, upon an average of a great many cows, it might be found to run as 10 or 12 to 1.

In the next place, the difference in the quality of the cream obtained from the two cups was much greater than the difference in the quantity. In the firſt cup the cream was a thin tough film, and very white; but in the laſt of a thick butyraceous conſiſtence, and of a glowing richneſs of colour, that no other kind of cream is ever found to poſſeſs.

And the difference in the quality of the milk that remained after the cream was ſeparated, was perhaps ſtill greater than either, in reſpect to the quantity or the quality of the cream. In the firſt cup it was a thin blueiſh liquid, as if a very large portion of water had been mixed with ordinary milk; while in the laſt cup it was of a thick conſiſtence and yellow colour, more reſembling cream than milk both in taſte and appearance. From this experiment it appears, that the perſon who, by bad milking of his cows, loſes but half a pint of his milk, loſes in fact about as much cream as would be afforded by ſix or eight pints at the beginning; and beſides, that part of the cream which alone can give richneſs and high flavour to the butter, where that is the object, is loſt.

Secondly. That if milk be put up in a diſh, and allowed to ſtand till it throws up cream, that portion of cream which riſes firſt to the ſurface is richer in quality and greater in quantity than what riſes in a ſecond equal portion of time; and the cream that riſes in the ſecond interval of time is greater in quantity and richer in quality than that which riſes in a third equal ſpace of time; and that of the third than the fourth, and ſo on, decreaſing in quantity and declining in quality continually as long as any riſes to the ſurface. Theſe experiments not having been, in this caſe, made with ſo much accuracy as in the former, the writer has not been enabled to aſcertain the difference in the proportion that takes place in equal portions of time; but they have been ſo often repeated as not to leave any room to doubt the fact: and it will be allowed to be a fact of no ſmall importance in the management of the dairy. It is not clear, however, but that a greater quantity of cream may upon the whole be obtained from the milk by taking it away at different times; but the proceſs is ſo troubleſome as not to be counter balanced by the increaſed quantity obtained; if, indeed, an additional quantity be thus obtained, which is not as yet fully aſcertained.

Thirdly. That thick milk always throws up a ſmaller proportion of the cream it actually contains to the ſurface than milk that is thinner; but the cream is of a richer quality: and if water be added to that thick milk, it will afford a conſiderably greater quantity of cream than it would have done if allowed to remain pure; but its quality is at the ſame time greatly debaſed.—This is a fact that every perſon attentive to a dairy muſt have remarked; but no experiment has been made that could aſcertain either the preciſe amount of

ſilver wire, fixed in the bottom of a large wooden bowl into the veſſels that are deſtined for its reception. But few experiments have hitherto been made with the view of deciding the moſt advantageous method of diſpoſing the milk for the pur-

the increaſed quantity of cream that might thus be obtained, or of the ratio in the decreaſe of its quality: but it aſcertains the effects, at leaſt, of mixing water with the milk in a dairy; and the knowledge of this fact will enable attentive perſons to follow that practice which they think will beſt promote their intereſt.

Fourthly. That milk which is put into a pail, bucket, or other proper veſſel, and carried in it to any diſtance ſo as to be much agitated, and in part cooled before it be put into the milk-pans to ſettle for cream, never throws up ſo much nor ſo rich cream as if the ſame milk had been put into the milk-pans directly after it was milked.—In this caſe it is believed, that the loſs of cream will be nearly in proportion to the time that has elapſed, and the agitation it has ſuſtained after being drawn from the cow: but the author is not yet in poſſeſſion of any experiments that ſufficiently aſcertain how much is to be aſcribed to the time and the agitation taken ſeparately.

From the whole of theſe facts and circumſtances, the following corollaries are deducible: 1ſt, That it is of importance that the cows ſhould be always milked as near the dairy as poſſible, to prevent the neceſſity of carrying and cooling the milk before it be put into the diſhes: and as cows are much hurt by far driving, it muſt be a great advantage in a dairy-farm to have the principal graſs-fields as near the dairy, or homeſtead, as poſſible. 2dly, That the practice of putting the milk of all the cows of a large dairy into one veſſel, as it is milked, there to remain till the whole milking be finiſhed before any part of it is put into the milk-pans, ſeems to be highly injudicious, not only on account of the loſs that is ſuſtained by agitation and cooling, but alſo, more eſpecially, becauſe it prevents the owner of the dairy from diſtinguiſhing the good from the bad cow's milk, ſo as to ſeparate theſe from each other where it is neceſſary. He may thus have the whole of his dairy product greatly debaſed by the milk of one bad cow, for years together, without being able to diſcover it.

3dly, That if it be intended to make butter of a very fine quality, it will be adviſable in all caſes to keep the milk that is firſt drawn ſeparate from that which comes laſt; as it is obvious that if this be not done the quality of the butter will be greatly debaſed, without much augmenting its quantity. It is alſo obvious, that the quality of the butter will be improved in proportion to the ſmallneſs of the proportion of the laſt drawn milk that is retained; ſo that thoſe who wiſh to be ſingularly nice in this reſpect will do well to retain only a very ſmall proportion of the laſt-drawn milk.

To thoſe owners of dairies who have profit only in view, it muſt ever be a matter of trial and calculation, how far it is expedient for them to carry the improving of the quality of their butter, at the expenſe of diminiſhing its quantity. In different ſituations, prudence will point out different kinds of practice as moſt eligible; and all perſons muſt be left, after making accurate trials, to determine for themſelves. It is likewiſe a conſideration of no ſmall importance, to determine in what way the inferior milk that is thus to be ſet apart, where fine butter is wanted, can be employed with the greateſt profit.

4thly, That if the quality of the butter be the chief object attended to, it will be neceſſary not only to ſeparate the firſt from the laſt-drawn milk, but alſo to take nothing but the cream that is firſt ſeparated from the beſt milk, as it is this firſt riſing cream alone that is of the prime quality. The remainder of the milk, which will be ſtill ſweet, may be either employed for the purpoſe of making ſweet-milk cheeſes,

poſe of raiſing the cream in the largeſt proportion, and the ſhorteſt ſpace of time: however, as the oily or butyraceous part of milk would ſeem to be diffuſed through the whole ſubſtance of the milk, and entangled among its particles, betwixt thoſe of the ſerous and caſeous kind, ſo as to be thrown up only in conſequence of its poſſeſſing leſs ſpecific gravity than the portion which is uſually termed milk, from its becoming in a ſtate of reſt; it would ſeem that the moſt ſuitable method of placing it for the purpoſe of creaming well, and in the moſt expeditious manner, is that of very ſhallow pans, leads or trays, ſo as that it may not ſtand deeper than three or four inches at the moſt; as in this way there will not only be the leaſt reſiſtance afforded, but the greateſt poſſible extent of ſurface for it to collect upon: by which means a larger proportion of cream is not only produced, but it is found from experience in the beſt dairy diſtricts, that in conſequence of the more expeditious cooling of the milk, the tendency to acidity in warm ſeaſons is conſiderably

or it may be allowed to ſtand to throw up cream for making butter of an inferior quality, as circumſtances may direct. 5thly, That, from the above facts, we are enabled to perceive that butter of the very beſt poſſible quality can only be obtained from a dairy of conſiderable extent, when judiciouſly managed; for when only a very ſmall portion of each cow's milk can be ſet apart for throwing up cream, and when only a very ſmall proportion of that cream can be reſerved as of the prime quality, it follows that, unleſs the quantity of milk were upon the whole very conſiderable, the quantity of prime cream produced would be ſo ſmall as to be ſcarcely worth the while for manufacturing ſeparately. 6thly, That from theſe premiſes we are alſo led to draw another concluſion, extremely different from the opinion that is commonly entertained on this ſubject, viz. That it ſeems probable that the very beſt butter could only be with œconomy made in thoſe dairies where the manufacture of cheeſe is the principal object. The reaſons are obvious:—If only a ſmall portion of the milk ſhould be ſet apart for butter, all the reſt may be made into cheeſe while it is yet warm from the cow and perfectly ſweet; and if only that portion of cream which riſes during the firſt three or four hours after milking is to be reſerved for butter, the rich milk which is left after that cream is ſeparated, being ſtill perfectly ſweet, may be converted into cheeſe with as great advantage nearly as the newly-milked milk itſelf. But as it is not probable that many perſons could be found, who would be willing to purchaſe the very fineſt butter made in the manner above pointed out, at the price that would be ſufficient to indemnify the farmer for his trouble in making it, theſe hints are thrown out merely to ſatisfy the curious in what way butter poſſeſſing this ſuperior degree of excellence may be obtained, if they chooſe to be at the expenſe; but, for an ordinary market, the writer is ſatisfied, from experience and attentive obſervation, that if in general about the firſt drawn half of the milk be ſeparated at each milking, and the remainder only be ſet up for producing cream, and if that milk be allowed to ſtand to throw up the whole of its cream, even till it begins ſenſibly to taſte ſouriſh, and if that cream be afterwards carefully managed, the butter thus obtained will be of a quality greatly ſuperior to what can uſually be obtained at market, and its quantity not conſiderably leſs than if the whole of the milk had been treated alike. This, therefore, is the practice that is thought moſt likely to ſuit the frugal farmer, as his butter, though of a ſuperior quality, could be afforded at a price that would always inſure it a rapid ſale.

checked and retarded. No trials have been inſtituted ſo as to decide what ſort of material is the moſt appropriate and conducive to this end: it is probable, however, that wood or ſtone is much better than lead, as being not only more eaſily kept clean and ſweet in conſequence of their being leſs diſpoſed to ſur, but from their being more ſafe, on account of their not being acted upon by the acid of the milk.

This is in ſome meaſure proved to be the moſt adviſeable practice, from its being almoſt generally adopted in the beſt dairy management.

There is likewiſe another point on which further experiments are wanting, which is that of aſcertaining the degrees of heat in which the different changes may take place with the greateſt certainty and ſucceſs at different ſeaſons.

From the few trials that have been made on this ſubject, it is believed, that when the heat is from 50 to 55 degrees on Fahrenheit's thermometer, the ſeparation of the cream from milk, which is the moſt important operation of the dairy, proceeds with the greateſt regularity and in the moſt favourable manner. It is therefore thought that this will be found to be the temperature that ought to be aimed at: but it is not pretended to decide with preciſion; a conſiderable degree of latitude in this reſpect may perhaps be allowable: from the beſt obſervation it ſeems to be highly probable that when the heat exceeds 60 degrees, the operation becomes difficult and dangerous; and when it falls below the 40th degree, they can ſcarcely be carried forward with any degree of œconomy or propriety. Till further experiments therefore aſcertain the exact point, it may be taken as a ſafe rule, that the heat ſhould be kept up, if poſſible, between the 50th and 55th degree; and in order to aſcertain this, a thermometer, graduated by Fahrenheit's ſcale, ſhould be hung up perpetually in the milk-houſe, to give notice to the owner of any alterations in the temperature of the air, that may affect his intereſt*.

It has not been yet ſhown, by any trials that can be fully depended upon, what is the length of time that the milk ſhould remain in the pans or trays in order to afford the cream in the largeſt quantity before it is ſeparated. Some ſuppoſe that this ſhould depend upon the particular views of the dairy-man, and the degree of heat that is preſent at the period.

In a moderately warm temperature of the air, if very fine butter be intended, it ſhould not be allowed to ſtand more than ſix or eight hours. For ordinary good butter it may ſafely be let ſtand twelve hours or more; but where the dairy is ſo large as to afford a ſufficient quantity of cream, and where the very beſt butter is

* Anderſon in Bath Papers.

intended (the milk being to be converted to ſome other uſe while yet ſweet), it may be ſeparated after ſtanding only two, three, or four hours*. "In the general management of dairies, milk is never ſkimmed more than once; but in the county of Eſſex, as well as ſome others, it is the common practice to ſkim it three or four times, or till no more cream riſe. In the buſineſs of ſeparating the cream from the milk there are two methods purſued; that moſt generally practiſed is to ſkim it off with a ſkimming-diſh, made either of tin or of wood. The other is adopted only where leads or ciſterns are common, and where the milk is uſed for making ſkim-milk or two-meal cheeſes; and, of courſe, before it coagulate, or acquire any degree of acidity. Towards the centre of the ciſtern there is a hole or pipe, which, before the milk be put in, is ſhut with a wooden ſtopper that riſes ſeveral inches above the ſurface of the milk. When the milk is wanted for any of the purpoſes above mentioned, a veſſel is placed under the pipe, and the ſtopper drawn up ſo far as to allow the milk to run off, but ſo gently, as that the ſurface of the cream may not be broken. The milk being thus gradually drained off, the cream ſinks down, till it at laſt reſts on the ciſtern; when the veſſel containing the milk being removed, and another placed for the purpoſe of receiving the cream, the ſtopper is entirely drawn out, and the cream drops into the veſſel †". The firſt of theſe methods "requires a dexterity of manipulation that can be acquired by practice alone: but it is of great importance to the ſucceſs of the dairy that it be well done; for, if any part of the cream be left, the quantity of butter will be diminiſhed; and if any part of the milk be taken, its quality will be debaſed ‡."

When the cream has been "thus ſeparated from the milk, it ought to be immediately put into a veſſel by itſelf, to be kept till a proper quantity be collected for being made into butter: and no veſſel can be better adapted for that purpoſe than a firm neat-made wooden barrel, in ſize proportioned to the extent of the dairy, open at one end, with a lid exactly fitted, to cloſe it. In the under part of this veſſel, cloſe to the bottom, ſhould be placed a cock, for drawing off from time to time any thin ſerous part of the milk that may chance to be generated; for, ſhould this be allowed to remain, it acts upon the cream in a powerful manner, and greatly diminiſhes the richneſs of the quality of the butter. The inſide of the opening of the barrel ſhould be covered with a bit of cloſe fine wire or ſilver gauze netting to keep back the cream, while the ſerum is allowed to paſs; and the barrel on its ſtand ſhould be inclined a little forward in the top, to allow the whole to run off §.

* Anderſon in Bath Papers. † Ibid. ‡ Modern Agriculture, Vol. III. § Ibid.

" It is difficult to ſtate any particular period for its being kept in theſe reſervoirs before churning, ſo different is the management in this particular in different places. About Epping, in Eſſex, which has been long in high repute for the ſuperior quality of its butter, the cream is ſeldom kept above three or, at furtheſt, four days*," but always till there is a certain degree of acidity in the cream, either natural or artificial, as without that they cannot inſure a good churning of butter: ſome keep a little old cream for this uſe; others uſe a little rennet, and ſome a little lemon juice†. And it was the practice in a large dairy in Suffolk, which had a high character for making butter of a ſuperior quality, when the butter was to be ſent directly to market, to churn the cream the ſecond or third day; but when it was to be ſalted, to keep it a day or two longer, or till it had acquired a certain degree of acidity. The dairy-woman, who had had a long and extenſive experience, accounted for her conduct in this reſpect by obſerving, that butter made from freſh cream was much better and pleaſanter to the taſte, but that it would not take in the ſalt ſo well, or keep ſo long, as that made from cream that had been longer kept‡.

It has been obſerved that thoſe " who have had little experience in the dairy, believe that no butter can be of the fineſt quality, except that which has been made from cream that has not been kept above one day; but this is a very great miſtake. So far indeed is this opinion from being well founded, that it is in very few caſes that even tolerably good butter can be obtained from cream that is not more than one day old. The ſeparation of butter from cream only takes place after the cream has attained a certain degree of acidity. If it be agitated before that acidity has begun to take place, no butter can be obtained, and the agitation muſt be continued till the time that that ſourneſs is produced; after which the butter begins to form. In ſummer, while the climature is warm, the beating may be, without very much difficulty, continued until the acidity be produced, ſo that butter may be got; but in this caſe the proceſs is long and tedious, and the butter is, for the moſt part, of a ſoft conſiſtence, and tough and gluey to the touch. If this proceſs be attempted during the cold weather in winter, butter can ſcarcely be in any way obtained, unleſs by the application of ſome great degree of heat, which ſometimes aſſiſts in producing a very inferior kind of butter, that is white, hard, and brittle, with very little taſte, and almoſt unfit for any culinary purpoſe whatever§." The judicious farmer ſhould not attempt to imitate this practice, but allow his cream to remain in the veſſel appropriated for keeping it, until it has acquired that proper degree of

* Modern Agriculture, Vol. III. † Abdy in Annals of Agriculture, Vol. XI.
‡ Modern Agriculture, Vol. III. § Anderſon in Bath Papers.

acidity that fits it for being made into butter with great eaſe, and by a very moderate degree of agitation; by which proceſs only very fine butter can be prepared.

The length of time cream may be kept before it attains the preciſe degree of acidity that is neceſſary to form the very beſt butter, and after that period before its quality be ſenſibly diminiſhed, has not yet been well aſcertained by experiment.

It is remarked by Doctor Anderſon that "ſo little nicety has been obſerved in this reſpect by practical farmers, even thoſe who have a high reputation for making good butter, that few of them ever think of obſerving any preciſe rule in this reſpect with regard to the different portions of their cream, ſeeing they in general make into butter all the cream they have collected ſince the former churning, ſo that the new and the old is all beaten up together; and he can find nothing like an uniform rule eſtabliſhed among them as to the time that ſhould intervene between one churning and another, that being uſually determined by local or accidental circumſtances. He is himſelf inclined to believe, that if the cream be carefully kept, and no ſerous matter allowed to lodge about it, a very great latitude may ſafely be admitted in this reſpect;" and though the exact length of time has not been determined, "it is certain that cream which has been kept three or four days in ſummer is in excellent condition for being made into butter; and he is inclined to believe, that from three days to ſeven may be found in general the beſt time for keeping cream before churning; though, if circumſtances make it neceſſary, a conſiderable latitude in this reſpect may be allowed. If the farmer has ſuch a quantity of cream as may be worth his while to churn once every day, there is nothing to prevent him from doing it. He has only to provide a ſeparate veſſel for holding the cream for each day he means it ſhould ſtand before churning; if three days, three veſſels; if four days, four veſſels; and ſo on. Thus he may churn every day cream of three days old, or of four, or any other number of days old that he may incline. In the ſame manner, if it were found that the cream of two, of three, or of a greater number of days gathering, was required to make a proper churning, it might be eaſy ſo to contrive it as to churn every day, as will be obvious to any one who thinks upon the ſubject. In this way the operations of a dairy may be kept perfectly regular and eaſy*."

It is frequently a practice in Cheſhire to churn the whole of the milk without ſeparating any part of the cream from it. After milking, it is cooled, according to the heat of the weather in ſummer, in ſeparate veſſels for the purpoſe, and a certain degree of acidity brought on, and warmed in the winter by being ſet by the fire. In this way they

* Anderſon in Bath Papers.

obtain a greater quantity of butter, though of an inferior quality. By careful management, however, eſpecially if a portion of the firſt-drawn milk be ſeparated, very good butter may, it is ſuppoſed, be obtained; but the practice, on many accounts, is not to be recommended *.

In ſummer, or while the cows are fed on graſs, no art is requiſite to give butter that colour which is agreeable to the purchaſer or the conſumer; but in the winter and ſpring months the dairy people find it neceſſary, in order to pleaſe their cuſtomers, to alter that tallowy appearance which is natural to butter in theſe ſeaſons. This is effected by means of a little *arnetta*, which, after being reduced by trituration to as fine a powder as poſſible, is mixed with the cream before it is put into the churn, and in ſuch quantities as, from experience, has been found neceſſary for giving the requiſite appearance.

Churning.—As while the oily or butyraceous part of the milk is in the ſtate of cream, the particles are not in a ſufficiently concentrated ſtate for producing an uniform ſubſtance, on account of the large portion of interpoſing ſerous fluid; in order to produce butter, it is therefore neceſſary to force out this by means of continued agitation in the proceſs of churning. The cream or milk, after being ſeparated and prepared as above, is to be put into the churn of the kind which is preferred, as there are ſeveral different ſorts employed in different places, and agitated for ſome time, in order to effect the ſeparation of the butter. "From the practice generally adopted in the beſt managed dairies of cooling the churn, by filling it for ſome time with cold water before churning in ſummer, and of warming it with ſcalding water when the weather is very cold in winter, and of putting in alſo cold or hot water among the cream in the churn occaſionally, according to the ſeaſon of the year," it is concluded "that cream poſſeſſing a proper temperature, whatever that temperature may be, is, among the moſt exact dairy farmers, conſidered eſſentially neceſſary in the making of good butter; which being admitted, it muſt follow that ſome churns may be better ſuited to the purpoſe than others—as ſuch as admit a free ſupply of atmoſpheric air, and permit that which, from the violent agitation, has become overheated to eſcape, from their preſerving that medium temperature which, it would appear, cream, in the courſe of making into butter, ought to poſſeſs, than ſuch as are kept conſtantly ſhut up, or in which the air is only allowed to enter or eſcape occaſionally by means of a ſmall aperture †." It is probably on this account that the upright churn is ſtill preferred in ſome dairies.

In this proceſs much greater nicety is required than moſt perſons ſeem to be

* Anderſon in Bath Papers. † Modern Agriculture, Vol. III.

aware of. It has been obſerved, "that a few haſty irregular ſtrokes may render the whole of the butter of ſcarcely any value,—that which, but for this circumſtance, would have been of the fineſt quality. The owner of an extenſive dairy ſhould, therefore, be extremely attentive to this circumſtance, and be at great pains to procure a proper perſon for managing this branch of the buſineſs*."

Making of Butter.—When, by the proceſs of churning, or keeping the cream conſtantly in a ſtate of motion, the butyraceous particles are ſeparated from the milk, and united to each other, the maſs is taken out of the churn and put into a large wooden bowl, or other convenient veſſel, with ſome cold ſpring water which is perfectly pure; after which the dairy-maid kneads it well with her hands, or, what is better, a wooden ſpoon with a ſhort handle, afterwards breaking it into as minute diviſions as poſſible, and, by rolling and preſſing it againſt the bottom and ſides of the veſſel, expreſſes and forces out any milk that it may contain. Upon this being well performed the goodneſs of the butter in a great meaſure depends. When it has been thus worked, the milky water is poured off, and an additional quantity of pure clean water put in; and the operations of kneading, breaking, and preſſing, are again renewed, and continued till the water at laſt appears ſcarcely tinged with milk, which is the only proper criterion by which to determine when the butter has been ſufficiently worked.

It has been obſerved by the above writer "that a conſiderable degree of ſtrength, as well as of dexterity, is required in this manipulation. The thing wanted is to force out the milk entirely, with as little tawing of the butter as poſſible; for, if the milk be not entirely taken away, the butter will infallibly ſpoil in a ſhort time; and if it be much worked, the butter will become tough and gluey, which greatly debaſes its quality†."

In moſt caſes a ſmall quantity of ſalt is mixed with butter which is intended for immediate uſe; and when butter is ſalted, whether it be with a view to keeping of

* Anderſon in Bath Papers.

† In Holland the method of making butter, according to the account of Mr. Carew, as ſtated in the Agricultural Report of Middleſex, is this:—After milking the cows, the milk is not put into pans till it is quite cold. It is then ſtirred two or three times a day with a wooden ſpoon, to prevent the cream from ſeparating from the milk; and if it can be ſtirred till the ſpoon will almoſt ſtand in it, it is deemed ſo much the better. When it is found to be ſufficiently thick, it is put into the churn, and beaten for an hour. When the butter begins to form, a pint or more of cold water, according to the quantity of the milk, is poured in, to ſeparate the butter from the milk. When the butter is taken out of the churn, it is waſhed and kneaded till the laſt water is perfectly clear and free from milk. By this method it is ſuppoſed that a greater quantity of butter is made from an equal quantity of milk. And the butter is ſaid to be firmer and ſweeter, and to keep longer, than that which is made in the ordinary mode which is in uſe in England. The buttermilk is alſo thought preferable. A churn is there thought better adapted to the purpoſe than a barrel.

for immediate ſale, the ſalt is applied as ſoon as the milk has been extracted or removed in the manner juſt deſcribed. Part of the butter is ſpread on the bottom of another baſon or *ſkeel*, which has been previouſly waſhed and prepared for the purpoſe; and a quantity of ſalt being ſtrewed over it, an additional layer of butter is then laid on; over this another ſprinkling of ſalt, and ſo on alternately till the whole be ſalted to the proper degree, according to the uſe for which the butter is intended. When the whole is thus ſalted, the dairy-maid again kneads, breaks, and works it in ſuch a manner as to make the ſalt mix intimately with it; and when ſhe thinks ſhe has fully effected this purpoſe, ſhe pours ſome ſpring or other cold water over the whole; and, by again working the butter, waſhes it free from the brine, and from any milky ſubſtance, which by the ſalting, and the repetition of kneading, preſſing, &c. may have been expreſſed.

The different operations of butter-making being thus performed, all that remains is to weigh and make it up into the form in which it is moſt ſaleable. The uſual form in which it is expoſed to ſale is in rolls; but it is ſometimes made into circular cakes of about three or four inches diameter, and about an inch thick, and on the top of which figures are impreſſed by means of a wooden print carved for the purpoſe. After the butter, in well-managed dairies, is weighed and made up for market, it is uſually placed in cold water till the period for ſending it to market arrives.

The quantity of butter produced from a given quantity of milk depends on a variety of particulars; as the quality of the milk, the age and quality of the paſtures on which the cows are maintained, and whether the milk be allowed to ſtand a ſufficient time to throw up the whole cream which it contains. But on a medium four gallons of milk will produce ſixteen ounces of butter; and the quantity which a dairy of cows of any magnitude, in regard to numbers, may be ſuppoſed to yield, may be rated at ſix pounds each per week in ſummer, and from four to five in winter, according to the manner of feeding them. In Suffolk they find that four gallons and a half of milk afford a quart of cream, which, when made into butter, weighs one pound and three quarters. Mr. Abdy found the average quantity of butter made by a cow per week to be four pounds, of ſixteen ounces, and the whole in nine months, one hundred and fifty-ſix pounds *, beſides the advantage of ſix ſhillings a-piece for three pigs.

lbs.	d.	£.	s.	d.		s.	d.	£.	s.	d.
* 156 at	10 per lb.	6	10	0	—But at the preſent price,	1	3	9	15	0
Calf	-	0	18	0	ditto - - - -			1	5	0
3 pigs	-	0	18	0	ditto - - - -			1	10	0
		8	6	0				12	10	0

An inferior ſort of butter is often made from whey, where cheeſe is the principal object of the dairy *.

Making of Cheeſe.—In the proceſs of cheeſe-making, as in moſt of the other operations of the dairy, there is a want of preciſion, from few experiments having been made, and thoſe with but little chemical exactneſs. As the buſineſs ſtands at preſent, the whole is conducted at random by mere cuſtom. The circumſtances that would ſeem to particularly demand attention in this art are, the *ſeaſon*; the *method of milking*; the *nature of the milk*; the *preparation of the rennet*; the *mode of colouring*; the *breaking and gathering the curd*; the *management of the cheeſe in the cheeſe-preſs*; the *method of ſalting*; and the *management in the cheeſe-room.*

Seaſon.—It is ſuppoſed that the beſt ſeaſon for making cheeſe is during thoſe months

* The methods of conducting the proceſs in this caſe are thus ſtated by Mr. Donaldſon:—

"In ſome dairies the whole whey, when taken from the cheeſe-tub, is put into ſkeels or other veſſels, where it remains about twenty-four hours, when it is creamed, and the whey applied to the uſe of the calves and pigs, the latter of which are ſaid to thrive as well on it after the latter has been taken from it as before. And the cream, when ſkimmed off the whey, is put into a braſs pan and boiled, and afterwards ſet in pans or jars, where it remains till a ſufficient quantity for a churning be procured, which in large dairies happens generally once, but ſometimes twice, in the week." In others "the green whey is put almoſt immediately from the cheeſe-tub into the furnace-pan, where it is ſcalded. When it acquires the proper degree of ſcalding-heat, cold water, or ſome white whey is occaſionally put in; this cauſes the whey to break, and throw up a thick white ſort of ſcum, ſomewhat reſembling cream, which the dairy-maid keeps conſtantly ſkimming off as it riſes, and which ſhe puts into cream-jugs or jars, where it remains till the uſual time of churning. In the dairies where the green whey is ſcalded, the runnings, except a little that is kept for the purpoſe of forcing the green whey when ſcalding, to throw up the cream, are uſually ſet in ſkeels or jars, in the ſame manner as the milk from the cows; and the cream, when taken off, being added to that procured by ſcalding, is churned in the ordinary way."

"In two experiments made for the purpoſe of aſcertaining the nature of making butter from whey, Mr. Robertſon found the reſult the ſame, though the proceſs was differently conducted. In one, the whey had ſtood twenty-four hours after being taken from the curd before it was put to the fire; but in the other it was put on quite warm and freſh immediately from the curd; the quality as well as quantity were alike in both theſe methods."

"The quantity of butter procured from whey is conſiderable: in two inſtances, where particular attention was beſtowed to aſcertain the fact, not leſs than about an ounce and a half from the gallon. In regard to the quality, it is unqueſtionably inferior to that of butter made from the cream of milk, or from the milk and cream churned together, but not ſo much ſo as ſtated by Mr. Marſhall in his Rural Economy of Glouceſterſhire, which is one-third. In the Report of the County of Leiceſter it is indeed obſerved, "that whey butter ſells for nine-pence per pound, when other butter ſells from ten-pence to eleven-pence; and alſo, that eighteen cows will make about ſeventeen pounds" (ſixteen ounces each) of whey-butter per week; which is a circumſtance, Mr. Donaldſon thinks, "that certainly merits the attention of thoſe who are in the practice of making either *one-meal* or *two-meal* cheeſes."

when the cows can be fed on the paſtures; that is, from the beginning of May till towards the end of September, or, in favourable ſeaſons, the middle of October. On many of the larger dairy farms in ſeveral diſtricts, cheeſe is frequently made throughout the year; but that made during the winter months is ſaid to be conſiderably inferior in quality, and much longer in becoming fit for ſale, or for uſe, than that which is made within the above period*. In Glouceſterſhire the ſeaſon of making *thin cheeſe* is from April to November; but the principal one for making *thick* is during the months of May, June, and the beginning of July. If made later in the ſummer, they are found not to acquire a ſufficient degree of firmneſs to be marketable the enſuing ſpring†. But where the cows are well fed in the winter ſeaſon, in the manner adviſed above, good cheeſe may undoubtedly be made at that time.

Milking.—The times of milking are different in different cheeſe-diſtricts: in Cheſhire they are in the ſummer ſeaſon at ſix o'clock both morning and evening, and in winter at day-light in the morning and immediately before dark in the evening. But in Wilts, Suffolk, and ſome other counties, the people are frequently employed in milking by four o'clock in the morning in ſummer; and the buſineſs in a dairy of forty or fifty cows is nearly completed before the period at which it commences in Cheſhire‡. The latter would ſeem the moſt preferable practice; as when the cows are brought home to the farm-yard, which is the beſt method where the paſtures are within a ſhort diſtance, they are milked unfettered, and the buſineſs is over before the heat increaſes ſo much as to make the cows reſtleſs and unruly. The farmer himſelf, or ſome careful perſon, ſhould always attend the milking of the cows, for the double purpoſe of ſeeing the work properly done, and carrying the milk in large buckets, into which it has been occaſionally emptied from the pails, to the dairy, to be poured through a ſtrainer into coolers for the purpoſe, or the cheeſe-tub, preparatory to applying the rennet. In all well-managed dairies particular attention ſhould be paid to the thorough milking of the cows; as where this is omitted the cows are not only apt to go dry, but become more liable to be diſeaſed. Beſides, it has been ſhown that the laſt part of the milk is very greatly ſuperior in quality to that which is firſt drawn from the bag.

The expeditious cooling of the milk, by putting it into leaden or other pans, is found of much utility in retarding the proceſs of fermentation in the ſummer ſeaſon, and thereby preventing the milk from turning into a ſtate of acidity. But in winter it is obviouſly unneceſſary. It has been ſuggeſted, that when the ſeaſon ishot the

* Modern Agriculture. † Ibid. ‡ Marſhall's Rural Economy of Glouceſterſhire.

quality of the cheeſe might be improved, and the difficulty of its being made leſſened, by cooling down the milk as ſoon as poſſible by repeatedly drawing off and returning it to the cooler.

Quality of the Milk.—It is obvious that on the quality of the milk the goodneſs of the cheeſe, with common management, muſt in a great meaſure depend. The quantity of cream that is uſed is generally in practice different, according as they are *one-meal* or *two-meal* cheeſes.

In Cheſhire "the general cuſtom, however, in the beſt dairies, is to take about a pint of cream, when two-meal cheeſes are made, from the night's milk of twenty cows. In order to make cheeſe of the beſt quality and in the greateſt abundance, it is admitted that the cream ſhould remain in the milk; but whether the cream that is once ſeparated from it can by any means be again ſo intimately united with it as not to undergo a decompoſition in the after-proceſs, admits of ſome doubt. There is, at leaſt, no abſurdity in attempting to prevent the ſeparation of two bodies which it is the profeſſed intention to unite again. If a cheeſe made entirely of the night's milk on which the cream has riſen be as rich as one made of new milk, all other circumſtances being alike, it is a proof that milk and cream after being ſeparated may, by heating alone, become as it were new milk again. Experiment alone can decide this point: but the practice here is to unite the milk and cream, as will be ſhown hereafter; and the dairymen ſay, that when ſo united it differs not from new milk as to the purpoſes of cheeſe-making*."

If the whole milking be directly made uſe of in its ſimple ſtate for the cheeſe, it is denominated a *one-meal* cheeſe; but where two milkings are blended, or *two-meal* cheeſe made, the quality of the milk uſed differs conſiderably; in ſome caſes the whole of the cream of the firſt meal is abſtracted, and in all caſes a certain portion. In ſome dairies the milk of the firſt meal is ſet in the leads or other veſſels as uſual; and as it is the evening's milk that is in common added to the ſucceeding morning's, the operation of cheeſe-making begins immediately after that of the morning milking is completed, as about five or ſix o'clock. The cream of the evening milk being ſkimmed off, the milk is carried and put into the cheeſe-tub, reſerving ſometimes a half, ſometimes a third, but more frequently only three or four gallons, to be applied as below. The milk reſerved, in any of theſe proportions, after being put into a braſs pan and made ſcalding hot, by placing the pan on a furnace or in a veſſel of hot water, is one half of it poured into the cheeſe-tub among the cold milk, and the other into the pan in which the cream had been put. The cream

* Agricultural Report, 4to.

and the hot milk being intimately incorporated, the whole is poured into the cheeſe-tub, which by this time has received a great addition, if not the whole of the morning's milk, warm from the cows. Thus the different meals' milk forms, as it were, a fluid of the ſame nature, equal in quality and temperature, and to which the rennet is applied in the uſual manner. This re-union, or, in the dairy phraſe, *melting the cream*, is probably the beſt method practiſed; but it is, we believe, not ſo effectual in forming cheeſe of the beſt quality as that where the milk is entirely new.

In making *ſkim-milk-cheeſes* the milk is ſet in the leads or pans as uſual, in which ſtate it remains longer or ſhorter, according to the weather, care being taken to ſkim off the cream, or to drain off the milk, in proper time, before it begins to acquire a ſouriſh taſte. If that ſhould at any time happen, either from the exceſſive heat of the weather, or owing to ſome inattention in the general management; in place of putting the ſkim-milk upon the furnace to give it that degree of heat ſuppoſed to be neceſſary for facilitating the coagulation after the rennet is applied, and which is the uſual practice, the method is, to put it directly into the cheeſe-tub, and to pour in ſuch a quantity of hot water as will give the wiſhed-for temperature. By this means, the riſk of the milk breaking while heating on the furnace, which when not quite ſweet and freſh it is apt to do, is avoided without inconvenience in other reſpects. In this ſort of milk it is neceſſary to add ſomewhat more rennet than is uſually applied to a ſimilar quantity of milk, which contains either the whole or a great portion of the cream.

Preparing the Rennet.—Milk may be coagulated, or turned into a curdled ſtate, by the application of any ſort of acid; but that ſubſtance which is moſt commonly uſed in the making of cheeſe is the *maw* or ſtomach of a young calf prepared for the purpoſe, and which is generally denominated *rennet*. The maws, which uſually contain a curdled kind of ſubſtance, on being purchaſed from the butcher, are opened, and the curd or thick ſubſtance taken out: this, having been repeatedly waſhed in cold water, as well as the bag which contained it, is again replaced with a conſiderable addition of ſalt, and then packed in a jar, into which is poured a very ſtrong brine of ſalt and water. In many inſtances the maws are allowed to remain in this ſtate for about twelve months before uſing; in others, after having remained for ſome time covered with the brine, they are taken out; and an additional quantity of ſalt being applied, they are hung up in the dairy, or ſome other convenient place, to dry, and remain in that ſtate till wanted for uſe.

But, from the preparation in this mode being made at different times, there

muſt be a great difference in their ſtrength, and of courſe in their effects, either when made uſe of after being ſteeped in ſome ſort of liquid, or in the piece.

Whether the proportion of rennet neceſſary for a ſeaſon be kept in *brine* or *pickled*, and afterwards dried, the beſt method, as attended with the greateſt degree of certainty in regard to its being of equal ſtrength and quality, is to extract the ſubſtance from the whole at once. This is frequently the caſe in Cheſhire, but in few other diſtricts.

In preparing theſe ſubſtances it is therefore, probably, a better practice to put the whole of the maws into an open veſſel, and to pour in two or three pints of ſpring water for each, according to the number. In this ſtate they ſhould be allowed to ſtand about twenty-four hours. They then may be taken out and put into other veſſels, with about half the quantity of water, and allowed to remain for a like period, then wholly removed and thrown aſide as no longer of uſe, and the firſt and ſecond infuſions mixed together, and ſtrained through a ſieve into a jar or other veſſel, a conſiderable quantity of ſalt being added. This liquor is then fit for uſe, and requires no after-management beyond that of taking off the ſcum that uſually riſes to the top, and of adding a little ſalt when that already in the jar is nearly diſſolved. About half a pint of this preparation, wine meaſure, is moſtly ſufficient for coagulating ſuch a quantity of milk as will make ſixty pounds of cheeſe. When a portion is taken out, the liquor ſhould be well ſtirred up. Other modes of preparing this ſubſtance are in uſe, but perhaps without affording any ſuperiority.

Colouring.—From the practice of colouring cheeſe having been ſo long common in the cheeſe-diſtricts, it is probable that thoſe of the beſt quality would be in a great meaſure unſaleable, if they did not poſſeſs the requiſite colour. The degree of colour is regulated chiefly by the name under which it is intended the cheeſe ſhould be ſold. The introduction of this practice originated in the intention of conveying an idea of richneſs; but the leaneſt cheeſe always requires the greateſt quantity of colour to bring it to the proper appearance*. The material which is uſually employed for this purpoſe is Spaniſh arnetta. The weight of a guinea and a half of it is conſidered in Cheſhire ſufficient for a cheeſe of 60lbs.; and in Glouceſterſhire an ounce is the common allowance to the hundred weight.—There are different ways of preparing as well as of applying it. The method uſed in Cheſhire is, when the dye is wanted in the morning, to tie up the neceſſary quantity of pounded arnetta in a linen rag, and to put it into about half a pint of warm water in the preceding evening. In the morning, immediately before applying the rennet, the infuſion of arnetta is poured into the milk, and the mixture is then well ſtirred about, ſo as to make the

* Cheſhire 4to Report.

milk and the dye incorporate intimately together. In other diſtricts it is common to rub a piece of unpounded arnetta, after having been previouſly dipped in milk, on a ſmooth ſtone, in the ſame manner that paint is ground. The colouring thus obtained is mixed with the milk in the cheeſe-tub, in the manner and at the period before mentioned, care being taken to prevent any of the unreduced particles of arnetta from falling into it.

Setting the Curd.—The degree of temperature which milk ought to poſſeſs, ſo as to be in the beſt poſſible condition for applying the rennet, is a point by no means fully decided. It is, however, admitted that the quantity and quality, or texture of the curd, depend much on the length of time the curd is in forming, and that on the quantity and ſtrength of the coagulum employed, the ſtate of the atmoſphere, and the heat of the milk, at the period of its being mixed*. In this matter the

* Mr. Marſhall obſerves that "it is known from daily experience, that the warmer the milk is when the rennet is put to it, the ſooner it will coagulate with a given quantity of rennet of a given ſtrength. It is equally well known, that the cooler the milk, and the longer it is in coagulating, the more tender and delicate the curd becomes: on the contrary, if the milk be too hot, and the coagulation takes place too rapidly, the curd proves tough and harſh. But it ſeems to be a fact equally well eſtabliſhed, that a cheeſe made from milk which has been coolly and ſlowly coagulated, is longer before it becomes marketable than one made from milk which has undergone a leſs deliberate coagulation; and which being drier, and of a harſher texture, ſooner becomes cheeſey and fit for the taſter. Therefore, the great art in this ſtage of the proceſs lies in the degree of warmth of the milk when *ſet*; that is, when the rennet is put to it; or in the degree of heat retained by the curd when it *comes*, that is, when the coagulation has ſufficiently taken place; or in the length of time between the ſetting and coming. Which length of time may be regulated either by the degree of the warmth of the milk when ſet; or by the ſtate of warmth in which it is kept during the time of coagulation; or by the quantity and ſtrength, taken jointly, of the rennet."

With a view to obtain ſome information on this ſubject, he made the following experiments:—

"In 1781, June 5, twenty-three gallons of milk, heated to ninety-ſix degrees of Fahrenheit's ſcale, with two tea-cupfuls of weakiſh rennet, came in one hour; the curd delicate and good. 6th. The ſame quantity of milk, of the ſame heat, with one tea-cupful of rennet, came in nearly the ſame time; the curd ſomewhat tough; owing, probably, to the milk having been burnt to the kettle in which it was heated. 7th. Twenty-ſeven gallons of milk, heated to ninety-four degrees, with the ſame quantity of rennet, came in about two hours; the curd very good. 8th. Twenty-ſix gallons of milk, heated to one hundred and two degrees, with one tea-cupful of rennet, came in two hours and a half; curd very good. 9th. Twenty-five gallons of milk, heated to one hundred degrees, with a tea-cupful and a half of rennet, came in about one hour and a half; the curd good, but ſomewhat tough; owing, perhaps, to the milk being kept too warm in the cheeſe-tub, by being covered up cloſe with a thick cloth. It is noted, that on the ſeventh and eighth the whey retained a heat of about eighty-eight degrees, whereas the whey this morning was ninety two degrees: ſo that, perhaps, it is not the heat when it is ſet, but the heat when it comes, which gives the quality of the curd. 10th. Twenty-five gallons: ninety-ſix degrees: two cups, uncovered, came in two hours and a quarter: whey eighty-ſeven degrees: curd very

practice of almoſt every particular dairy differs from that of another. That which is adopted in Cheſhire is, that the loweſt degree of heat which milk ought to poſſeſs, when the rennet is applied, is one half of that of the milk from the cow;

tender. 11th. Twenty-three gallons: one hundred degrees: more than a tea-cup: uncovered: did not come in two hours; owing to the rennet being lower in ſtrength than before: therefore, added a little more rennet: which brought it in about three hours from the firſt ſetting: the whey eighty-ſeven degrees: the curd uncommonly tender. 12th. Twenty-four gallons of milk: one hundred degrees: two cups of rennet: uncovered: came in two hours: whey eighty-nine degrees: curd uncommonly tender. 13th. Twenty-eight gallons of milk: ninety-two degrees: three cups (ſay ſtrongly renneted) covered up with a coarſe linen cloth: came in one hour and a half: whey eighty-ſix degrees: curd very good, and of a very fine colour: though perhaps would have handled tenderer if it had not ſtood ſome time after it came before it was broken up. Perhaps, ſays he, much depends on its being broken up in the critical minute. 14th. Twenty-eight gallons: one hundred degrees: two cupfuls: uncovered: came in one hour and a quarter: whey ninety-four degrees: curd ſomewhat harſh, but of a good colour. The change of colour, therefore, he thinks owing to the change of paſture.

"He here notes, that the milk ſhould be covered to make it come together: this came and grew hard at the bottom half an hour before it was ſet at the top. 15th. Twenty-eight gallons: milk heated to ninety-five degrees: with two cups of rennet; and covered after it had ſtood three quarters of an hour: came in one hour and a half: whey eighty-nine degrees (the morning warm): curd very good and tender. 16th. Thirty gallons of milk heated to one hundred and three degrees, but lowered by two pails full of cold water to ninety-ſix degrees; with two cups and a half of rennet; and kept cloſe covered: came in one hour: whey ninety-four degrees: curd pretty good, but not ſufficiently tender. 17th. Twenty-eight gallons: ninety-ſeven degrees: two cups and a half: covered; but not cloſe: came in one hour and a half: whey not tried: curd ſomewhat tough. It is noted, that the toughneſs was owing, perhaps, to ſome milk of a new-calved cow being among it. And, alſo, to try the exact heat of milk immediately from the cow, immerged a diſh in the pail while milking. After it had lain long enough to receive a degree of heat equal to that of the milk in the pail, emptied it, and immediately milked into it from the teat (the cow being at this time about half milked); the heat ninety-five degrees; and likewiſe, that the cheeſes of yeſterday (the 16th of June) preſs remarkably elaſtic, and ſpungy, like a fungus: perhaps owing to the milk's coming too hot; or perhaps to two or three of the cows being then a-bulling; or perhaps, being made thicker than uſual, the preſs was not heavy enough for them: or perhaps this ill quality is owing to the cold water being put into the milk. He afterwards found that milk of a cow, on the day of amour, retained, after having ſtood for ſome time in the pail after milking, ninety-eight degrees of heat. This ſhows that the ſtate, if not the quality, of the milk is altered by the heat of the cow; and a cautious dairy-woman always endeavours to keep ſuch milk out of her cheeſe-tub.

"June 18th. Thirty gallons: ninety-five degrees: covered: came in one hour and a half: whey ninety-two degrees: curd pretty good. 19th. Thirty gallons: ninety-two degrees: two cups covered: curd very good. 21ſt. Thirty gallons: ninety-eight degrees: lowered by half a pail of cold water to ninety-five degrees: the curd good; but the cheeſes, like thoſe of the 16th preſs, hollow and ſpungy. Therefore it is probable, from theſe two incidents, that lowering the heat of the milk with cold water has an evil effect. 23d. (Evening) fifteen gallons of new milk warm from the cow, retaining

the higheſt about twice the natural warmth. From this it is inferred, "that by the time a large dairy of cows can be milked, and the milk be put together for the purpoſe of artificial coagulation, the dairy-maid will not err materially by applying the rennet immediately afterwards*." This rule is however very uncertain, and liable to exception, on account of the variation in the ſeaſons, and the frequent and great changes that take place in the ſtate of the weather in the ſame ſeaſon. Accordingly, "in all dairies remarkable for cheeſe of a ſuperior quality, the heat of the milk, before the rennet is applied, is raiſed or lowered, by the addition of warm milk or of cold water, to that degree which, in the practice of the particular dairy, is found from experience the moſt eligible†." The milk produced on poor clayey lands is found to require more warming than that afforded by ſuch as are rich, for where this is much heated the proceſs is rendered more difficult. The frothy matter ariſing in conſequence of the air that is entangled with the new milk in pouring it into the cheeſe-tub, is in all caſes carefully ſkimmed off, and put into the cream-veſſels.

It is thought "ſurpriſing that in large dairies the uſe of the thermometer is not as well known as that of the *ſkimming-diſh*—as to aſcertain with preciſion, by a courſe of well-conducted experiments, the temperature the moſt proper for milk to poſſeſs at the time the rennet is applied, could not fail to be greatly in favour of the quality of the cheeſe, and would, in all probability, tend to prevent the cracking, bliſtering,

a heat of ninety-two degrees, with two cups and a half of new weak rennet, and cloſely covered, came in three quarters of an hour: whey eighty-eight degrees: curd very delicate and good. 25th. Forty gallons of half-ſkimmed milk, heated to eighty ſeven degrees, with three cups of rennet, ſlightly covered, came in three quarters of an hour: whey ſeventy-nine degrees: curd remarkably good of this ſort. On September 8, in obſerving the effect of ſome remarkable ſtrong rennet, he found that an ordinary teacupful coagulated ſufficiently upwards of forty gallons of milk, heated to only eighty-eight degrees, in thirty-five minutes.

"From the whole of theſe experiments it appears, he thinks, that curd of a good quality may be obtained from milk heated from 87 to 103 degrees of Fahrenheit's thermometer; provided the rennet be ſo proportioned that the time of coagulation be from three quarters of an hour to two hours and a half; and provided the milk be kept properly covered during the proceſs of coagulation. And from theſe as well as a variety of other trials, which he made in the courſe of the ſummer, it appears to him at preſent, that 80 to 90 are the proper degrees of heat; that from one to two hours is the proper time of coagulation; and that the milk ought to be covered ſo as to loſe in the proceſs about five degrees of its original heat. But, ſays he, climature, ſeaſons, the weather and the paſture, may require that theſe bounds ſhould ſometimes be broken. A few obſervations, made in one ſeaſon, and in one place, how accurately ſoever they may have been taken, are by no means adequate to the entire illuſtration of this very abſtruſe ſubject."

* Modern Agriculture, Vol. III. † Ibid.

and hoving, which ſo frequently take place in cheeſe in conſequence of ſome miſmanagement in the making *.

An inſtrument has been lately invented †, which, if found on experience to anſwer, muſt have the effect of throwing a great deal of light on the whole ſyſtem of dairy-huſbandry, and muſt be the means, in time, of reducing the buſineſs of butter- and cheeſe-making, which is at preſent carried on without any eſtabliſhed rules by which the operator can be certainly guided, to ſomething like fixed invariable principles. It is termed a lactometer. By the uſe of this inſtrument, together with the thermometer, and by diſcovering a mean whereby to aſcertain the ſtrength and quality of the rennet, and the proportion which is neceſſary to be uſed for coagulating a given quantity of milk, Mr. Donaldſon ſuppoſes the management of a dairy where cheeſe is made would be greatly improved. Practice is the only means by which the operator can acquire a proper knowledge of this branch of the buſineſs; but the conſequences of proper or improper conduct are well known in every cheeſe-dairy; as, when the coagulation is accelerated or retarded beyond the proper time, which in making a 60lb.-cheeſe is reckoned an hour and a half, either by giving too much or too little rennet, or by applying it when the milk is too hot or too cold, not only the quantity of the curd is diminiſhed, but the quality in either caſe materially affected. In the former caſe it becomes of a tough gluey texture; in the latter it is too tender. After the rennet has been applied, the milk-tub is covered up by a board, over which is laid a linen cloth; and having ſtood the uſual time, the operator, on finding that the coagulation is completed, proceeds with the work of ſeparating the curd from the whey.

Breaking and gathering the Curd.—Though this buſineſs may appear ſimple and uniform, there are few particulars in the art of cheeſe-making wherein ſo great a difference is obſervable in practice. In ſome dairies the curd is at firſt broken or cut in various directions with a cheeſe-knife, an inſtrument made for the purpoſe, and uſed with a view of making the whey ſeparate eaſily, and without carrying off with it any richneſs from the curd. After theſe firſt inciſions, ſome time is allowed for the broken curd to ſubſide. The knife is then again uſed, and more freely than before; and while the operator ſtirs up the unbroken curd from the bottom with the ſkimming-diſh in one hand, the larger pieces of curd are cut with the knife held in the other. Having thoroughly broken the curd, and allowed ſome time for its ſubſiding, the operator begins to take off the whey with the ſkimming-diſh. In other

* Donaldſon's Preſent State of Huſbandry, Vol. III.

† By Mr. Dicas of Liverpool.

dairies, not leſs celebrated for good cheeſe, the ſkimming-diſh only is uſed in breaking the curd; and to facilitate the operation of ſeparating the whey from the curd, ſome of the whey that firſt riſes to the top is ſkimmed off, and being either heated or cooled, according to the ſtate of the weather, and the required conſiſtence of the curd, is again returned into the cheeſe-tub, and after remaining a little time the whole is laded off in the uſual manner. All the whey that can be extracted without preſſure having been removed, and the cheeſe-tub being raiſed at one ſide, the curd is collected into a maſs, and at firſt preſſed with the back of the ſkimming-diſh. When no more whey can be diſcharged by this means, others more violent are adopted: the curd is in many caſes cut with the cheeſe-knife, as before, to give vent to the whey, and is then preſſed as hard as poſſible with the hands; in others, a conſiderable weight is frequently applied. The curd having been in a great meaſure ſeparated from the whey, it is put into two or three pans, or other veſſels, and the cheeſe-makers break it with their hands as fine as poſſible; in the courſe of doing which, a proper quantity of ſalt is ſcattered over the curd, and intimately mixed therewith *.

In Glouceſterſhire, when the curd is broken to the requiſite fineneſs, it is again returned into the cheeſe-tub, where it is ſcalded, by pouring over the minutely broken curd a pailful of hot water, or of whey, or of whey and water mixed. After the ſcalding water or whey is applied; the whole is briſkly ſtirred; and being allowed to ſtand for ſome time, for the curd to ſettle at the bottom of the tub, the ſcalding materials are ſkimmed or poured off; and the curd being preſſed as before, ſo that no more whey can be extracted, it is put into the vat, and preſſed in the common way. When it is properly broken, rubbed, and ſalted, a cloth is ſpread over the cheeſe-vat; and the broken curd being packed into it, and covered up with the cloth, a board is laid over the vat, and a weight, heavy in proportion to the quantity of curd, placed upon it; by which means the remaining whey is preſſed out †.

Mr. Marſhall obſerves, that "it ſeems to be underſtood, that different grounds require different kinds of ſcalding liquor. The quantity is in proportion to the quantity of curd, enough to float the curd,—and make the mixture eaſy to be ſtirred about with the diſh. Part of it is heated to near boiling heat, and this lowered with cold liquid to a heat proportioned to the ſtate of the curd: ſoft curd is ſcalded hot, hard curd with cooler liquid. In ſcalding, therefore, the dairy-woman has a remedy for any misjudgment her ſenſe of feeling may have led her into in the ſtage of coagulation: let the curd come too ſoft or too hard, ſhe can bring it to the deſired texture by the heat of the ſcalding liquid.

* Donaldſon's Preſent State of Huſbandry, Vol. III. † Ibid.

And here ſeems to hinge, principally, the ſuperior ſkill of the Glouceſterſhire dairy-woman:—by running the milk cool, ſhe can, in ſcalding, correct any error which has been committed in the former operation."

Extenſive dairies ſhould always be plentifully furniſhed with vats of different ſizes, as, when three or four cheeſes are made at each meal, a number of vats become actually in uſe; and if there are not ſtill a number empty, the operator becomes confined in choice, and cannot proportion exactly the vats to the quantity of curd in the cheeſe-tub; and by keeping a little overplus curd from meal to meal a whole cheeſe is often ſpoiled*.

* Mr. Price on the authority of Signor Vitabni gives the following as the method of making Parmeſan cheeſe:—It is "to put, at ten o'clock in the morning, five *brents* and a half of milk, each *brent* about forty-eight quarts, into a large copper, which turns on a crane, over a ſlow wood-fire, made about two feet below the ſurface of the ground; the milk is ſtirred from time to time; and about eleven o'clock, when juſt luke warm, or conſiderably under blood-heat, a ball of rennet as big as a large walnut is ſqueezed through a cloth into the milk, which is kept ſtirring. By the help of the crane the copper is turned from over the fire, and let ſtand till a few minutes paſt twelve; at which time the rennet has ſufficiently operated. It is now ſtirred up and left to ſtand a ſhort time. Part of the whey is then taken out, and the copper again turned over a fire ſufficiently briſk to give a ſtrongiſh heat, but below that of boiling. A quarter of an ounce of ſaffron is now put in to give it a little colour; and it is well ſtirred from time to time. The dairy-man frequently feels the curd. When the ſmall, and, as it were, the granulated parts feel rather firm, which is in about an hour and a half, the copper is taken from the fire, and the curd left to fall to the bottom. Part of the whey is now taken out, and the curd brought up in a coarſe cloth hanging together in a tough ſtate. It is then put into a hoop, and about half a hundred weight laid upon it for about an hour; after which the cloth is taken off, and the cheeſe placed on a ſhelf in the ſame hoop. At the end of two, or from that to three days, it is ſprinkled all over with ſalt; the ſame is repeated every ſecond day for about forty or forty-five days, after which no further attention is required. While ſalting, they generally place two cheeſes one upon another; in which ſtate they are ſaid to take the ſalt better than ſingly."

In making Stilton cheeſe, the proceſs, according to the Agricultural Report of Leiceſterſhire, is this: "The night's cream is put into the morning's new milk with the rennet, and when the curd is come it is not broken as is done with other cheeſes, but taken out with a ſoil-diſh altogether, and placed in a ſieve to drain gradually; and as it drains kept gradually preſſed, till it becomes firm and dry; then placed in a wooden hoop, and afterwards kept dry on boards, turned frequently with cloth binders round it, which are tightened as occaſion requires."

The method of making green cheeſe is this: "For a cheeſe of ten or twelve pounds weight, about two handfuls of ſage and one of marigold leaves, and a little parſley, are bruiſed and ſteeped one night in milk. Next morning the greened milk is ſtrained off, and mixed with about one third of the whole quantity to be run. The green and the white milks are then run ſeparately, keeping the two curds apart until they be ready for vatting. The method of mixing them depends on the fancy of the maker. Some crumble the two together, mixing them evenly and intimately; others break the green curd into irregular fragments, or cut it out in regular figures with tins for this purpoſe. In vatting it the fragments or figures are placed on the outſides.

Having made choice of a vat or vats, proportioned to the quantity of curd, ſo that the cheeſe, when fully preſſed, ſhall neither-over-nor under-fill, the operator ſpreads a cheeſe-cloth looſely over the vat, into which he re-breaks the curd, carefully ſqueezing every part of it in the hand; and, having filled the vat heaped up, and rounded above its top, folds over the cloth, and places it in the preſs.

Where the cheeſes uſually made are of a large ſize, as in Cheſhire, the operator thruſts a number of iron ſkewers, through holes made in the ſides of the vat for the purpoſe, into the curd in various directions. Theſe being withdrawn, the openings made by them ſerve as ſo many drains for permitting the whey to run off. When the whey, inſtead of running freely, only falls in drops, the weight is removed, and the curd rebroken, and, being again put into the vat, is managed in the ſame manner as before, and repeated while a drop of whey can be extracted. The curd being now almoſt entirely freed from the whey, it is again placed in the vat, a clean cloth having been previouſly ſpread for the purpoſe of receiving and incloſing it*.

Management in the Preſs.—After the vat has been properly placed in the preſs, a ſuitable degree of preſſure is applied, which is more or leſs according to the ſizes of the cheeſes. In all large dairies there are two or three preſſes, all varying in reſpect to power, weight, or preſſure. As ſoon as the vat is placed in the preſs, and the weight applied, ſkewers are again thruſt in through the holes in the ſides of the vat: this is done repeatedly during the firſt day the vat is in the preſs. From the time the vat is firſt placed in the preſs, till it is again taken out, does not in common exceed two or three hours. When taken out, the cheeſe is put into a veſſel with warm or hot whey, in order to hardening its coat or ſkin, where it ſtands for an hour or two; it is then taken out, wiped dry, and after having remained ſome time to cool, is covered with a clean dry cloth; and the vat being wiped dry, and the cheeſe replaced, it is again put into the preſs. In the evening, ſuppoſing the cheeſe to have been made in the morning, which is the common time, it is again taken out of the vat, and another dry cloth being applied, is returned and replaced, what was formerly the upper becoming now the under ſide. In this manner it is taken out, wrapped in clean cloths, and turned in the vat twice a-day for two days, when it is finally removed†. Cloths of finer qualities are made uſe of at the different turnings, in order that as little of their impreſſion as poſſible may be left on the cheeſe.

The bottom of the vat is firſt ſet with them, crumbling the white or yellow curd among them. As the vat fills, others are placed at the edges, and the remainder buried fluſh with the top." The after-treatment is the ſame as that of plain cheeſes.

* Cheſhire 4to Report. † Donaldſon's Preſent State of Huſbandry, Vol. III.

Salting.—After the cheeſe has been at laſt removed from the preſs, it is carried to the ſalting-houſe, and placed in the vat in a tub filled to a conſiderable depth with brine, in which it ſtands for ſeveral days, being regularly turned once at leaſt every day. The vat is then removed from the brine-tub; and the cheeſe being taken out is placed on the ſalting-bench, where it ſtands for eight or ten days, ſalt being carefully rubbed over the whole every day during that period. When the cheeſe is of a large ſize, it is commonly ſurrounded with a wooden hoop, or fillet of cloth, to prevent renting. After it is ſuppoſed to be ſufficiently ſalted, it is waſhed in warm water or whey, and, when well dried with a cloth, is placed on what is called the drying-bench, where it remains an equal length of time before it is removed to the keeping-houſe or cheeſe-chamber. In ſome dairies, the new cheeſes are not put in brine, but kept in the vats on the ſalting-benches; and after being rubbed with ſalt, and turned in the vats daily for a week or ten days, the vats are removed, and the cheeſes managed as above. In other dairies the cheeſes are ſalted while the operation of preſſing is performing. At every time they are taken out of the preſs for the purpoſe of being turned in the vats, they are well rubbed with ſalt, which for ſmall thin cheeſes, ſuch as are commonly made in Wiltſhire and Glouceſterſhire, is found to be ſufficient; and therefore, when taken for the laſt time from the preſs, in place of any more ſalt being applied, they are ſet at once upon the drying-benches. In fact, the practice of immerging new-made cheeſes in brine is only adopted where they are of ſo large a ſize that rubbing ſalt on the outſide would not be ſufficient for anſwering the intended purpoſe*.

Management in the Cheeſe-room.—After the cheeſes have been properly ſalted, and have acquired a competent degree of dryneſs, they are carried from the ſalting-houſe to the cheeſe-room, where, after being ſmeared with freſh butter, they are laid on the floor, or on ſhelves for the purpoſe. For the firſt ten days or a fortnight they are pretty ſmartly rubbed every day, and the ſmearing with butter repeated; but after that period it is only neceſſary to rub them two or three times a week: yet they ſhould be turned every day while in the dairy-man's poſſeſſion, which is longer or ſhorter according to the ſeaſon of the year, and the demand. In order to haſten the maturation and coating of the cheeſe, the temperature of the room ſhould be uniform and rather warm. In ſome caſes the floors are prepared by being rubbed over with different green vegetable ſubſtances, ſuch as bean-tops, &c. and in others covered with dry ſubſtances; but theſe are probably unneceſſary.

The produce of a dairy of cows, where the milk is converted into cheeſe, is

* Donaldſon's Preſent State of Huſbandry, Vol. III.

variouſly ſtated by different farmers. In ſome diſtricts two hundred weight and a half from each cow, whether a good or bad milker, if at all in milk, is conſidered a good annual return. In others, the average runs as high as three; and in the county of Wiltſhire in particular from three and a half to four is the uſual quantity. From accurate calculations made by Mr. Marſhall, and theſe ſeveral times repeated, he found that in Glouceſterſhire about fifteen gallons of milk were requiſite for making little more than eleven pounds of two-meal cheeſe, and that one gallon of new milk produced a pound of curd. It is the general opinion of dairy-farmers, that the produce of from two and a half to three and a half acres of land is neceſſary to maintain a cow all the year round. "Taking, therefore, the medium of the three averages of cheeſe above mentioned (amounting to 355lbs. from each cow), the quantity of cheeſe by the acre is 118lbs.*" Every calculation of this kind muſt, however, be extremely vague and uncertain†. The correctneſs of this is, however, to a conſiderable degree confirmed by Sir William Petty's Statement, in his Political Economy of Ireland, in regard to the quantity of milk which he ſuppoſed the cows in that country to yield in the year, viz. "for ninety days three gallons, for other ninety days one gallon; for the next ninety days a quarter of a gallon, and for the remainder of the year none, making in all three hundred and eighty-four gallons; which, conſidering that in every dairy a certain quantity of cream is abſtracted before the milk is put into the cheeſe-tub, it may be ſuppoſed, when converted into one-meal or two-meal cheeſes, to make little more or leſs than 355lbs. as has been juſt ſtated."

It is obvious that, in both the butter- and cheeſe-dairy, a great part of the profit muſt neceſſarily ariſe from the keeping and fattening of hogs. In this intention the ſkim-milk, butter-milk, and cheeſe-whey, ſhould be converted to the purpoſe for which they are the moſt adapted, which would ſeem to be that of ſupporting ſows that have pigs, and rearing young pigs. It has been obſerved that "in theſe applications they are better than any other article of food within the farmer's command, that is to be had equally cheap; and by means of keeping a number of breeding ſows, proportioned to this uſe of the milk and whey of the dairy, and making a

* Donaldſon's Preſent State of Huſbandry, Vol. III.

† It has been ſtated by the author of the Agricultural Report of Somerſetſhire, that the groſs produce of a cheeſe-dairy frequently averages twelve pounds the cow, and in particular caſes fourteen pounds: "but this can only be done," ſays he, "when cheeſe is at the preſent *enormous* price of near ſixpence per pound twelve months old; and fat hogs at ſixpence per pound." The advance on both theſe articles has been conſiderable ſince the above was written, ſo that the profit muſt now ſtand much higher.

proper proviſion for the other ſort of hogs, ſo that they need not rob this application, the moſt profit poſſible will be made of theſe important objects to the farmer, by his cows and ſwine†." In this ſyſtem of management it is of vaſt advantage to have the hog-ſties convenient to the dairy, with ſuitable ſunk ciſterns, properly formed for the reception and retention of the milk, whey, &c., which ſhould be conveyed to them by pipes from the lip of the cheeſe-preſs, and a receiver on the outſide of the dairy or ſcalding-room, ſo that every thing may be taken away without the labour of being carried ‡, and nothing be waſted. Mr. Abdey, in ſpeaking of the butter-dairies of Epping, remarks, that the farmers there buy pigs

The following eſtimate, made at that time, of the expenſes and produce of a dairy, where both the land and cows were of the *firſt quality*, may in ſome degree ſhow the advantage of this management:

Dairy Twenty Cows.

Dr.	*l.*	*s.*	*d.*	*Cr.*	*l.*	*s.*	*d.*
To two milkers, forty weeks, at 3s. per wk.	6	0	0	By ninety hundred of cheeſe, at 45s.*	202	10	0
To a man's labour, winter ſerving cattle, changing their paſture, ſelling cheeſe, &c.	4	0	0	By calves	15	0	0
To dairy women, 4s. 6d. per week	11	14	0	By butter	10	0	0
To dairy utenſils, candles, ſalt, bruſhes, mops, and all other articles	4	6	0	By hogs	25	0	0
To arnetta	1	0	0		252	10	0
To rent, thirty acres of ſummer paſture, 40s.	60	0	0				
To ſkimming the ſame, and making ſix tons of hay	3	0	0				
To rent of fifteen acres mown ground, 40s.	30	0	0				
To making the hay, ſay thirty tons, at 12s. per acre	9	0	0				
To tithe, taxes, &c. ſay	10	0	0				
	139	0	0				
To profit, intereſt of money, and the decreaſing value of cows included	113	10	0				
	252	10	0				

N. B. A large dairy might be kept for 25s. per cow.

* At this time (January 1797) cheeſe of laſt year's making is worth three pounds per hundred.

† Annals of Agriculture, Vol. XXXII. ‡ Ibid.

at four or five months old, (which in the year 1788 coſt about 18s. a piece,) and keep them on ſkimmed milk for the ſpace of a month, and then ſell them at the profit of about 6s. The proportion in which they are kept is about that of one to every three cows in milk; which, as their long-horned Derbyſhire breed of cows moſtly continue to milk for nine months, will be in the ratio of three pigs to each cow, or eighteen ſhillings, but at the preſent prices more than thirty ſhillings.

Grazing.—There are particular ſituations and kinds of graſs land on which this ſyſtem of management may be had recourſe to with much more profit and ſucceſs than that of dairying. This is moſtly the caſe in all thoſe diſtricts where the extent of arable land is inconſiderable when compared with that which is in the ſtate of paſture, and of courſe the value of graſs-produce but ſmall, in compariſon to that of fattened animals. In all the tracts of graſs land that are ſufficiently fine and rich enough in quality to fatten oxen or other large cattle, this practice may be adopted and carried on with profit and advantage, and is probably the beſt application of ſuch lands that can be attempted. This indeed is fully ſhown by moſt of the rich, fine, marſhy, or other tracts of graſs land in different parts of the kingdom being almoſt invariably conducted under ſome branch of the grazing ſyſtem.

The ſucceſs of this practice, like thoſe of moſt others employed in the art of huſbandry, will depend on different circumſtances; as the ſituation and quality of the land, the accuracy of the management in regard to the method of ſtocking and feeding it; the nicety of the farmer's judgment in adapting the animals in nature, ſize and quality to its particular condition; and, above all, to his diſcernment in ſelecting ſuch ſtock, of whatever kind it may be, as is perfectly healthy and diſpoſed to fatten, as well as in obtaining it at ſuch price as that it may pay well for the keep beſtowed upon it; and in ultimately diſpoſing of it, when brought into proper condition, to the beſt advantage.

The ſtocking of grazing lands with a proper kind of animals is probably one of the

The encouragement of the dairy is on the whole ſtrongly recommended, but only on condition that a different ſort of management be adopted from that now practiſed, in reſpect to the feeding of the cows, which are almoſt univerſally depaſtured in the fields both ſummer and winter: in conſequence of which, the dung produced even by a large dairy is trifling indeed; whence ariſes a manifeſt declenſion in the fertility of the land, and a grazing farm may be diſtinguiſhed at a great diſtance from a dairy one. "In this exhauſted ſtate (ſays the author) the dairy land muſt remain, unleſs a different ſyſtem of management be ſucceſsfully inculcated." It is therefore ſuggeſted that all dairy farms ſhould be accompanied with a due proportion of arable, as perhaps a *fourth part*, for the purpoſe of raiſing various kinds of crops as winter food, ſuch as have been noticed; and that proper ſtalls and bartons be erected as a reſidence for the cows during the winter months, in which they may be ſoiled with theſe productions.

moſt nice and difficult points in the whole range of farming. In the natural ſtate, ſuch animals are in general produced on the lands as are ſuited to the ſtate and nature of their herbage: thus, in the mountainous diſtricts, where the graſs is ſhort and light, the ſmall breeds of both cattle and ſheep prevail; while in the low, rich, marſhy, or other paſtures, where the graſs is more full and luxuriant, we have the larger breeds of theſe different animals. It will therefore be neceſſary, in this buſineſs, for the farmer to conſider two things: firſt, what ſort of ſtock may be the moſt proper for the particular kind of land on which they are to be grazed; and, in the ſecond place, what ſorts may afford the greateſt profit in the conſumption of the herbage. It will probably in moſt caſes be found, that upon the ſtrong and more dry rich paſtures the larger ſorts of cattle and ſheep will be the moſt proper, and turn out to the greateſt advantage; but that on ſuch as are leſs dry and luxuriant the different ſmaller breeds of cattle, as well as ſheep, may be found to pay the beſt. This is in ſome degree proved by the practice of the graziers in different diſtricts. On the rich lands in Suſſex * and Lincolnſhire, as well as other grazing counties, they prefer the large breeds of cattle as well as ſheep for the purpoſe; while in many others that are leſs fertile, the ſmaller ſorts are found more to the advantage of the grazing farmer. In paſtures where the graſs is ſhort, ſheep are moſtly the proper ſort of ſtock.

But beſides this circumſtance of adapting the ſtock to the nature and ſituation of the land, the properties of the breeds muſt be attended to. Thoſe ſorts, whether cattle or ſheep, which have the property of keeping themſelves fat, or in tolerable condition, with the leaſt expenditure of food, ſhould be conſtantly preferred, whatever the ſize or breed may be. It is a quality that has been obſerved to be of much greater importance to the grazier than that of ſize, abſtractedly conſidered †.

It has been well obſerved, that where the grazier has fine and rich paſtures, he may "chooſe his beaſts as large as he can find them, provided they are of the right breed and ſhape; but let him always prefer ſhape to ſize; for it will aſſuredly pay him better." And it is added that "thoſe who are upon indifferent graſs muſt take care to proportion the ſize of their beaſts to the goodneſs of their paſtures; their cattle had much better be too ſmall than too large; there are vaſt tracts of land that will" anſwer well in grazing, which are not good enough to ſupport large breeds ‡."

The ſame thing, probably, holds good in a great meaſure with reſpect to ſheep.

Where the ſtock is bred upon the land, there will be little difficulty in fixing

* Synopſis of Huſbandry. † Annals of Agriculture, Vol. XXXII. ‡ Ibid.

upon fuch animals as are the moft fuitable in thefe different intentions; but as it will frequently be neceffary for the farmer to purchafe his ftock at fairs and other places, much care and attention, as well as knowledge, will be requifite for him to do it in the moft advantageous manner. It is of great importance in this bufinefs to provide fuch as have been kept in a proper manner, and are in a healthy, thriving condition; as, where the contrary is the cafe, they are difficult, and require a much greater length of time, to be brought into the ftate proper for fale than would otherwife have been neceffary. It is perhaps experience alone that can qualify the grazier to form a correct judgment in thefe refpects: in general, however, he is led to the choice of ftock by no fixed or fcientific principles, but by the impreffion the appearances of the animals have upon him. It has been obferved that the experienced grazier, who has been accuftomed to attend fairs and markets, knows at fight, or by the affiftance of the flighteft touch, whether the animals he is about to purchafe will fuit him. Their general form and looks pleafe him. They are every where clean; have little offal about them; their eyes are full and vivid; their countenances brifk; their fkins alive, and their flefh mellow. On the whole, they have the refemblance of thofe which have been grazed before with fuccefs. Others are rejected, from the grazier not having found any fuch as they refemble to have done well, but many to have turned out in an unprofitable manner *.

There are, however, principles in this branch of the farmer's bufinefs which may be attended to with great advantage, as the animals have certain points or parts, the proper or improper forms of which denote them to be valuable or the contrary for this purpofe. Thefe are, that the legs fhould be fhort in proportion to the fize of the animal; the back very ftraight, broad and flat; the loins wide; the carcafe deep round, or rather barrel-fhaped below; the fore-quarters round, full, and fpreading; the bones fmall; the flefh affording an elaftic feel; the fkin thin, and a difpofition to fatten well, and on the beft parts. Where thefe marks are predominant, the ftock is mofily fuitable for the purpofes of the grazier.

It has likewife been remarked, that where the hair of the hide, in fattening cattle, is inclined to curl inftead of being ftraight, they are moft difpofed to thrive. This has been found to be the cafe in practice in different parts of the kingdom †. In lean beafts alfo, when the hair of the hides is curled, they commonly keep themfelves in better condition than where the contrary is the cafe. In all cafes a difpofition in the animals, of whatever fort they may be, to wildnefs, and not remaining quietly in

* Marfhall's Rural Economy of Midland Counties, Vol. I.

† Annals of Agriculture, and Wright's Hufbandry in Scotland.

the paſtures, forms an inſurmountable objection in this ſyſtem of management; as no animal ever fattens well that has a tendency to ramble: it is quietneſs, feeding quickly, and lying much, that has the greateſt tendency to make them become fat in a ſhort time. From the reſult of actual experiment with four different beaſts, in which the leaſt poſſible difference could not be diſcovered on the moſt minute examination, it has been ſhown that too much attention cannot be beſtowed in the choice of the breed of fattening ſtock, as, though they were in every reſpect the ſame in appearance, two, from their ſuperior diſpoſition to fatten, were found to afford a profit in the proportion of fifteen ſhillings the week, while the other two did not yield more than about five ſhillings and tenpence*.

In different ſituations different ſorts of both cattle and ſheep muſt often be preferred from the eaſe and convenience of procuring them; but the graziers in the midland diſtricts for the moſt part find that variety of the long-horned, termed the Craven breed, to anſwer the beſt, as having the moſt advantageous form, and the greateſt diſpoſition to fatten readily, eſpecially as improved by Mr. Bakewell. In Lincolnſhire ſome prefer the large ſhort-horned breed, others long-horned, with a mixture of other kinds; as the different ſorts of Scotch, and ſuch as are bred in the neighbourhood. In Somerſetſhire the dark red Devonſhire breed is the moſt prevailing ſort, which have alſo of late been more in demand by the beſt graziers in Leiceſterſhire, Oxfordſhire, and Warwickſhire. In the London markets theſe are ſaid to come next to the Galloway Scots that are fattened by the Norfolk and Suffolk graziers, in the fineneſs of the grain of their fleſh and their internal fatneſs †. The Cumberland and other North Country graziers moſtly employ the home breeds, which are in general of the long-horned kind, with both the Scotch breeds, the Kiloe and Galloway. They find the Kiloes the quickeſt feeders, the Galloways the next, and their own the ſloweſt ‡.

The Hereford ſhire, Glamorganſhire, and Suffolk Polled breeds are all found valuable as grazing ſtock in different ſituations §.

The breeds of the particular neighbourhood, as well as cattle of the ſmall Welſh or Scotch kind, may often be the moſt profitable where the graſs lands are not of a rich or fertile nature, as the ſize of theſe may be more eaſily proportioned to the quality or goodneſs of the lands; and there are ſcarcely any ſo indifferent as not to be capable of bringing the ſmalleſt to a ſufficient ſtate of fatneſs for the market.

In regard to the deſcriptions of this ſort of ſtock that may be employed with the

* Annals of Agriculture, Vol. XIV. † Billingſley in Somerſetſhire Report.
‡ Corrected Report of Cumberland and Northumberland. § Ibid.

greateſt profit by the grazing farmer, they are unqueſtionably oxen and ſpayed heifers, the latter in general fattening not only much better, but more expeditiouſly *, but are not capable of being procured with ſuch facility; and of the former kind, ſuch as have been accuſtomed to work are preferred in almoſt every grazing diſtrict, as both fattening more kindly, and making better beef than others that have not been employed in that way †. When killed at a great age, after being kept to work, the beef has been found extremely good ‡. In ſome caſes cows that have become dry, as well as ſuch old cows as are found unfit for other uſes, are purchaſed by the grazier for the purpoſe of fattening; but the danger of ſucceſs in theſe inſtances is always conſiderably greater: of courſe, though they occaſionally turn out to much advantage, ſuch as have been mentioned above are conſtantly to be preferred. Cows, eſpecially thoſe that are of much age, ſcarcely ever fatten well, and never in a quick manner: they can therefore hardly ever be equally profitable for the uſes of the grazier as thoſe of other ſort of young ſtock. Whenever cows are employed for the purpoſe of grazing, they ſhould conſtantly be let take the bull either before they are turned into the paſtures, or as ſoon after as poſſible, and be always in a ſtate fit for the market at leaſt three months before the period of their calving.

In this buſineſs, rather young or middle-aged cattle ſtock are perhaps always to be as much preferred as poſſible, from their having in general a greater propenſity to thrive and become fat. And it is of material conſequence, as has been juſt mentioned, that they are in a good thriving condition when bought in; as when this is the caſe they become fat with leſs food, and in a much ſhorter ſpace of time.

In regard to ſheep ſtock, it is probable that in general the large improved long-woolled breeds may be the moſt profitable on the more rich and productive paſtures; but on thoſe where there is a leſs degree of fertility, and the graſs is ſhorter, the more ſmall ſhort-woolled improved breeds are preferable for the uſes of the grazier. In the firſt of theſe caſes, that ſort which is termed the New Leiceſter has of late years had numerous advocates, and is, perhaps, when all its properties are conſidered, to be in *general* preferred to any of the other long-woolled breeds: though, in particular inſtances of very rich grazing lands, in the view of wool, there are other ſorts that may probably be more advantageous. Where wethers are capable of being procured of the New Leiceſter kind, they moſtly turn out an excellent ſtock for the grazing farmer. In the latter inſtance the South Downs are in common the moſt advantageous ſort, as not being exceeded, perhaps, by any of

* Liſle's Huſbandry, Vol. II. † Ibid. ‡ Annals of Agriculture.

the ſhort- or middling-woolled breeds. There are many other breeds of both the long and the ſhort-woolled kinds that may be employed with equal if not greater advantage in particular ſituations, and under particular circumſtances.

In Somerſetſhire the Polled ſheep of the lower part of that diſtrict have lately gained ground over thoſe of the Dorſetſhire ſheep, formerly the prevailing ſort by the beſt grazing farmers. They afford a large ſhear of wool, fatten quickly, and particularly on the internal parts. They are ſuppoſed capable of improvement by croſſing with the new Leiceſter breed *. The Romney Marſh graziers principally employ the white-faced Polled and the South Down breeds, both of which they find profitable on their lands. The Cumberland graziers chiefly ſtock with the true black-faced Heath and Cheviot breeds of ſheep, the former of which they find the more quick feeders, as well as more hardy †.

It has been obſerved to be an advantage in the grazing of ſheep, to procure them from ſituations where the lands are leſs rich than thoſe on which they are to be fattened, as under ſuch circumſtances they are found to thrive in a more rapid manner, and, from their bearing the pen or fold with leſs injury, become fat in a ſhorter ſpace of time ‡.

In the ſyſtem of grazing management, many different methods of practice are employed, both in reſpect to neat cattle and ſheep. With ſome graziers it is a method to purchaſe their cattle in the fairs in the autumn ſeaſon, about October or in the following month, ſupporting them, during the winter, principally with ſtraw, or ſometimes, which is a much better practice, with a little hay mixed with it, till towards the beginning of March, continuing their fattening through that and the ſucceeding month with ſome ſort of ſucculent food, ſuch as turnips, potatoes, or other ſimilar kinds, until the graſs be in a ſtate fit to be turned upon in May, on which they may be carried forward and completed according to circumſtances about Auguſt, or in the following month.

Another method of management is to purchaſe the beaſts lean, as ſoon as the graſs lands are in a ſtate fit to be turned upon in May, wholly completing their fattening on the graſs about the latter end of October, or later in the autumn, according to their quickneſs in feeding. In this ſyſtem of practice the ſmaller ſorts of cattle ſtock may be found in general the moſt advantageous, eſpecially where the lands are not of the moſt fertile or luxuriant kind.

The grazier has alſo ſometimes recourſe to another mode of proceeding in his

* Somerſet Report. † Cumberland Report. ‡ Kent's Hints.

ſyſtem of fattening neat cattle; but which is, we believe, in general leſs profitable than either of the preceding methods: this is that of buying in his ſtock at ſuch periods, according to the difference in their ſizes, as that they may be ready to be diſpoſed of about April, or in the ſucceeding month, a period at which they uſually fetch a high price. In this ſyſtem, with large oxen or other ſorts of beaſts, it is ſometimes the practice to keep them through two winters, giving them only one ſummer's graſs; being in the firſt winter not fully fed, but kept in good graſs in the ſummer ſeaſon, and forced on with the beſt feeding in the ſecond; but with the ſmaller ſorts of ſtock, one ſummer's graſs and a winter's ſtalling is the uſual mode; the cattle being bought in as ſoon in the ſpring as the graſs is riſen to a good bite.

In ſome diſtricts heifers are preferred to oxen, in which caſe they buy them in about March or April, and, after keeping them through the ſummer, ſell in October and November. This method is thought by ſome a profitable ſyſtem of management. All thoſe methods may probably be practiſed with advantage under different circumſtances; but it is obvious that the firſt can only be had recourſe to with propriety where green winter food is raiſed in ſufficient abundance, and the grazier has a ſtore of litter for being converted into manure. Under other circumſtances the ſecond mode of management will be much more profitable. The two laſt methods are the leaſt convenient, and, probably, on the whole, except in very favourable circumſtances, the leaſt profitable, eſpecially the former of them, as, from the great length of time which they are kept, much management and attention to food becomes neceſſary to render them advantageous; which, with common ſervants, is ſeldom ſufficiently regarded.

Beſides theſe, there is another practice that deſerves attention in particular caſes, ſuch as that of buying in ſmall cattle in tolerable condition in the autumn as ſoon as the after-graſs is ready, in order to their being fattened out on the rouens, and diſpoſed of towards the latter end of October or beginning of the following month. This is a practice ſometimes beneficially purſued on the rich hay-farms in the county of Middleſex.

With ſheep ſtock different ſyſtems of grazing are likewiſe in uſe. In ſome caſes, where the lands are in a ſtate of incloſure, it is a profitable practice to buy ewes in lamb in the latter end of ſummer or beginning of autumn, keeping them on the inferior ſorts of graſs lands, ſtubbles, or fallows till the beginning of January, and then by giving them turnips or cabbages to keep them in good condition through the period of their lambing, and afterwards in the beſt manner that can be contrived, in order that the lambs may become fit for the butcher ſufficiently early to

admit of the ewes being afterwards fattened, and diſpoſed of in the beginning of the autumn.

Another method of grazing ſheep is to purchaſe wether ſtock about the beginning of May at the age of two or three years, keeping them ſcantily till ſome weeks after the grounds have been cleared from hay, then bringing them to good keep in the rouen, afterwards fattening them by means of turnips or cabbages ſo as not to have them ready ſooner than the beginning of March, which is uſually the ſeaſon in which they fetch the beſt price. This is a ſpecies of grazing-management that moſtly affords a good profit to ſuch farmers as are ſufficiently attentive to it.

In addition to theſe methods, there is another practiſed in ſome caſes with great profit and advantage, which is that of buying in lambs of the wether or other kinds about the beginning of September. Theſe are kept in different methods by different managers: by ſome they are brought forward with the greateſt poſſible expedition by the beſt keep, ſo as to be ready to be diſpoſed of as ſoon as poſſible. Others, however, adopt the contrary method, keeping them only in a middling way during the winter till about the beginning of April, and then forcing them by good keep ſo as to have them ready for the butcher in Auguſt, or continuing them in the following month, and then clearing the whole of the ſtock from the land. This is a practice from which great profit is often derived*.

The providing of graſs-lamb for the markets as early as poſſible in the ſpring months is an object of great importance, and which pays the grazier well in many ſituations, eſpecially near large towns. In this view it is the practice to procure the more forward ewes, ſuch as thoſe of the Dorſet kind, which may drop their lambs in the beginning of January, if not before. In Middleſex, where this management is much attended to in conſequence of the great demand, it is the cuſtom to purchaſe this ſort of ewes at Kingſton, Weyhill, and other fairs in the neighbourhood. The ewes, in order that they may have a plentiful ſupply of milk, are extremely well kept on turnips and fine green ſweet rouen hay, and the lambs thereby forced forward in ſuch a rapid manner as to be ready for the markets in the beginning of March or April. The ewes, from their becoming dry ſo early, are capable of being fattened and diſpoſed of towards Michaelmas, uſually fetching the prices at which they were purchaſed in at: as the whole of the ſtock is in this ſyſtem cleared

* Corrected Report of Middleſex.

within the year, the farmer has the opportunity of fully aſcertaining its advantage or diſadvantage*. In this management very much depends upon keeping the ewes perfectly well fed, and in dry warm incloſed paſtures, as without ſuch attention the ewes are apt to become thin and lean in conſequence of the greatneſs of the evacuation, and afterwards to require a much longer time in being made fat.

In the fattening of graſs lambs Mr. Marſhall, in his Midland Counties, has mentioned a practice which in particular caſes may be adviſable; this is that of removing the lambs from the ewes when they decline much in milk, before they are perfectly fattened, in order to complete them on young clover or other ſorts of "prime keep." The principle in this caſe is that of the ewes becoming ſooner ready for the butcher: beſides, it is ſuppoſed by ſome, that after the firſt fluſh of milk is gone and it begins to be ſcanty, the lambs thrive better "on graſs alone away from the ewes" than when kept along with them, as the hankering after the little milk that is afforded prevents their feeding freely on the graſs. Where this method is followed, which can probably be with advantage only where the milk of the ewes is *greatly* deficient in ſupporting and bringing the lambs forward, much atttention muſt be paid to having the keep early and in abundance. In this view rye-graſs and white clover for early uſe, and broad clover at a later period, may be the moſt proper and, uſeful crops. In this management the ewes ſhould be carefully examined occaſionally; and, where much deficiency in the milk is found, the lambs be immediately removed to the paſtures.

The proportion in which different ſorts of cattle and ſheep ſtock ſhould be introduced upon the graſs lands with the view of being fattened, muſt depend chiefly upon the goodneſs of the land, the ſize of the ſtock, and various other

* The account is thus ſtated by Mr. Middleton, in his Survey of the Agriculture of the County of Middleſex:

	£.	s.	d.
Lamb, ſold at - - -	1	10	0
Ewe, do. do. - - -	1	10	0
Wool, 2s. 6d. or - - -	0	2	0
Together	3	2	0
Deduct prime coſt	1	12	0
Remains the increaſe of an ewe in one year	1	10	0

circumſtances that have been already noticed*. In Somerſetſhire, when at graſs on the rich and middling ſorts of land, they allow from one acre to an acre and a half to an ox, and ſome add one ſheep to each ox.

The great principle is never to ſtock in ſuch a way as to reſtrict the animals in the leaſt degree; as it is by filling themſelves quickly, and lying down much, that the greateſt progreſs in fattening is made, whether in cattle, ſheep, or any other ſort of animals when at graſs. On the weaker graſs lands a much ſmaller proportion of ſtock than on thoſe of the rich and fertile kind can only be admitted. Often not more than an ox and a ſheep or two, to two acres or two acres and a half. There is alſo another circumſtance that is neceſſary to be attended to in bringing the ſtock properly forward in the paſtures, which is that of changing them more frequently than has generally been the caſe with graziers. On this principle, as well as thoſe of their affording greater degrees of warmth and ſhelter, and thereby promoting the growth of the herbage more abundantly, ſmall incloſures may be

* In the able Agricultural Survey of Lincolnſhire, Mr. Young, in order to afford a more clear idea of the various proportions, has drawn them into the following tabular form for the richer paſtures in that diſtrict:

Places.	Sheep in ſummer per acre.	Acres per bullock in ſummer, with the ſheep.	Sheep in winter per acre.	Rent.
Long Sutton	5½	2½		
Mr. Scroop	11	No bullocks.		
Boſton, &c.	4	1½	2	
Skirbeck	5	1½	2	
Boſton	5	1	3½	
Deeping Fen, Mr. Graves	5	2	1½	40
Alderchurch, Mr. Berridge	7½	2	3	
Swineſhead	2½	1	2	
Ewerby	3	2½	2	30
Horbling, &c.	3	2	2	
Howel	3	3	2	
Immingham	1	1½	2	
Grainthorp, &c.	3	3	1½	
Stallenborough	2	2	2	
Skidbrook	1½	1½	½	
Ditto, &c.	2	2	2	35
Addlethorpe	5	1¼	2	40
Goſberton	6	1		
Burgh, &c.	5	2	2	40
Wrangle	2	2	—	36
Hundred of Skirbeck	2	1½	2½	45
Wibberton	5	2	2	
Marſh Chapel	3	2	—	35
Ditto	3	1	—	45
Grimſby	2¾	1	2¾	
Average	3¾	1¾	2	

more advantageous in the grazing of live ſtock than large ones; but to have them varying in ſize from ten or fifteen to twenty-five acres or more, according to the nature of the paſtures, may be the perfection of the ſyſtem: the matter is not, however, eaſily decided by experiment, as no two pieces of graſs land can ſcarcely be met with that are preciſely equal in all their different circumſtances.

In the diſpoſal of the ſtock after it has been made fit for the butcher, conſiderable care is neceſſary to perform it in the moſt advantageous manner. It has been obſerved, that though this is a leſs difficult part of the buſineſs of the grazier than that of buying in, it demands much judgment and experience to manage it in the beſt way*. Some utility in directing this matter may be derived from a careful attention to the manner of fattening in the animals during the time they are at full graſs, and from the conſideration of the length of time they have been; but the moſt correct judgment may probably be formed by the occaſional uſe of the weighing machine, by making accurate compariſons of the living with the dead or profitable weights of different ſorts of animals that are ſold on the farm; as by this means, after a few trials, a facility in correctly deciding on the dead weights of ſuch parts of the ſtock as the living weights have been fully aſcertained in, may be attained. It is in this way that the butcher has a ſuperiority over the grazier. All the ſmaller ſorts of animals, ſuch as calves, ſheep, and hogs, may have their living weights aſcertained with great eaſe and convenience by the ſimple means of a pair of large *ſteelyards* being fixed up in any convenient place, and a ſort of contrivance for containing them, with doors at the different ends, uſually termed a *cage*. The frequent weighing of all ſorts of fattening animals may alſo be beneficial in other ways; it will ſhow with exactneſs the progreſs that is made in the feeding of any ſort of animals, and the proper periods of diſpoſing of them, as well as any changes that may be neceſſary in their paſture or other food, and at the ſame time aſcertain the pay of each†. In this buſineſs it is moſtly, however, the caſe for the grazier to decide by the eye, and the feel of the animal, but this mode is extremely fallacious, even with thoſe who have had a large experience.

In the mode of diſpoſing of his fat ſtock, the grazing farmer muſt be directed by the nature of his farm and the circumſtances of his ſituation. In the ſouthern parts of the iſland, Smithfield is the principal market; but in the northern parts of the kingdom the ſeveral large towns. In the firſt caſe, on the ſmaller ſorts of farms, the fattened ſtock is moſtly ſent up by men who are ſolely employed in the buſineſs,

* Marſhall's Midland Counties, Vol. I. † Corrected Report of Somerſetſhire.

and who are termed diſtrict drovers, being regularly employed by different graziers in the ſame neighbourhood, and in whom they have the moſt perfect confidence But where the farms are very extenſive, ſo as to enable the graziers themſelves to regularly ſend droves of cattle or other ſtock to this market, the common practice is to depend upon ſaleſmen for the diſpoſal of them.

On very ſmall farms, where the lots are not ſufficiently large to make it an object to have them brought up in theſe ways, it may be more profitable to diſpoſe of them to the butchers at home. The advantage of theſe different markets muſt depend much upon the particular circumſtances of the caſes. It has, however, been ſuggeſted that amongſt the Somerſetſhire graziers it is a prevailing opinion that the London market, from the great fluctuation in the prices on account of the differences in the ſupply, is only calculated for thoſe who pay a regular weekly attendance*. The differences in the expenſes, including the ſaleſmen's commiſſions, are very conſiderable, as amounting in London to twelve ſhillings per head, while in the country markets they are not more than from three to five ſhillings†.

It is evident, from what has been advanced, that the advantage of grazing muſt be influenced by a variety of circumſtances and be very different in different inſtances and ſituations; but that in all caſes it muſt very materially depend on the goodneſs of the ſyſtem, and the excellence or ſuperiority of management that is practiſed. It has been obſerved, in ſpeaking of Romney Marſh grazing, that no regular method can be adopted in that ſort of management, and that the profits of no two graziers are perfectly "alike on the ſame given quantity of land," nor could they be "upon the ſame land," as years, prices, and abilities differ with each individual‡. It is conſequently impoſſible to give any ſtatements that can be generally applicable§.

* Corrected Report of Somerſetſhire. † Ibid.

‡ Price in Annals of Agriculture, Vol. XXI.

§ In Somerſetſhire the profit of grazing is thus ſtated by Mr. Billingſley, after obſerving that a grazier occupying two hundred acres of land may fat yearly one hundred head of oxen, to which add two hundred and ſeventy ſheep and ten colts, conſtituting altogether a profit comfortable, but by no means *exorbitant*.

GRAZING.

Dr.	£.	s.	d.	*Cr.*	£.	s.	d.
To rent of 200 acres, average value 40s. an acre	400	0	0	*Oct.* By fifty oxen, at 18l. . .	900	0	0
				May. By fifty oxen at 13l. . .	650	0	0
Carry forward	400	0	0	Carry forward	1550	0	0

In other diſtricts the profits of this practice appear to much greater advantage*.

In the Romney Marſh ſyſtem of grazing, which is chiefly by ſheep, the advantages

GRAZING.

Dr.	£.	s.	d.	*Cr.*	£.	s.	d.
Brought forward	400	0	0	Brought forward	1550	0	0
To tithe and taxes, ſay	50	0	0	By profit on ſeventy ſheep, ſummer kept	40	0	0
Feb. To fifty oxen, at 11l.	550	0	0	By profit on ten colts	40	0	0
July. To fifty oxen, at 7l.	350	0	0	By profit on two hundred ſheep winter fatted, and ſold in April			
To mowing and making fifty acres of hay, at 10s.	25	0	0	unſhorn	100	0	0
To ſkimming and making fifty acres of ſummer-leaze, at 3s.	7	10	0		1730	0	0
To wages throughout the year, beſides the farmer's labour	50	0	0				
To accidents	20	0	0				
	1452	10	0				
To profit (intereſt of capital and accidents included)	277	10	0				
	1730	0	0				

* In Lincolnſhire, on the authority of T. Fydell, Eſq. the following account is given by Mr. Young of the profits of grazing the rich lands:—

GRAZING ACCOUNT *for* 20 *Acres*, 1796.

Dr.	£.	s.	d.	*Cr.*	£.	s.	d.
To 18 beaſts, at 12l. each	216	0	0	By 18 beaſts, at 19l. 5s.	346	10	0
To 80 ſheep, at 46s.	184	0	0	By 80 ſheep, at 55s.	220	0	0
				By 52 tod of wool, at 17s.	44	4	0
	400	0	0		610	14	0

To Expenſes viz.	£.	s.	d.			
Tithe	1	10	0			
Dyke-reeve	3	0	0			
Rates	10	0	0			
Shepherding	3	0	0			
Expenſes	5	0	0			
				22	10	0
Loſs, ſuppoſed one ſheep				2	6	0
				424	16	0
Intereſt one year				21	4	0
One year's rent				60	0	0
				506	0	0
Hire of a cloſe for the winter for 35 ſheep				17	10	0
				523	10	0
Profit				87	4	0
				610	14	0

It is added that the difference between the buying and ſelling price, loſs deducted, 208l. 8s., is the

are ſtated in the following way by Mr. Price*; but in conſidering them proper additions are to be made for the advances that have taken place ſince they were drawn up. They in ſome meaſure ſhow the ſyſtem that is purſued in theſe rich marſhes.

In ſome caſes the young horſes may be grazed upon the coarſer ſorts of paſtures with advantage; but in general, except under the breeding ſyſtem, it will be more profitable to keep them on green food cut freſh as it is wanted during the ſummer ſeaſon: the benefit in the way of manure is very great in this method. Some adviſe the grazing of young horſes in the ſame paſtures with the fattening ſtock, in order that the graſs may be more evenly fed down; but this is probably a miſtake; and as they are very apt to diſturb and drive the cattle about, it may be a better practice to let them follow the feeding ſtock, or be put into a ſeparate paſture. The ſuperiority of eating down graſs lands by ſheep in compariſon to horſes was found very remarkable by Mr. Young, in Lincolnſhire. In Somerſetſhire, where any horſes are admitted on the grazing grounds, it is very ſparingly, not more than in the proportion of one to twenty acres†.

It has long been a practice to turn hogs upon pieces of graſs land adjoining the

produce of the land, or 10l. 8s. per acre, which is very great indeed, and ſhows that this land would let at 5l. 4s. an acre, *ſuppoſing this year to be an average one.* This difference of rent would deduct 44l. from the profit of 87l. and leave 43l.; which, with 21l. charged, makes 64l. intereſt on the year's advance of 546l. or 11½ per cent.

* *An Account of Stock bought in for Fifty Acres of Paſture Land, for the Year* 1778.

	£.	s.	d.
310 barren ewes, at 1l. 1s. each	325	10	0
90 South Down wethers, at do.	94	10	0
10 ſteer runts	98	15	0
10 Suſſex oxen	115	0	0
8 ſteer runts	49	10	0
Rent, at 30s. per acre	75	0	0
Expenſes, at 5s. per acre	12	10	0
	770	15	0

Stock ſold off Fifty Acres of Paſture Land, in the Year 1788-89.

	£.	s.	d.
310 barren ewes, at 31s. each	480	10	0
90 South Down wethers, at do.	139	10	0
10 ſteer runts, at 13l. each	130	0	0
10 Suſſex oxen, at 15l. each	150	0	0
10 ditto, to keep 18 weeks, at 2s. per week each	18	0	0
8 ſteer runts, ſold at 9l. each	72	0	0
2 ditto, to keep 12 weeks, at 1s. 6d. per week each	1	16	0
8 packs 3 draughts of long wool, at 8l. 10s.	74	7	6
1½ ditto of fine wool, at 12l.	18	0	0
Total	1084	3	6
Deduct	770	15	0
Clear profit	313	8	6

† Billingſley's Agricultural Survey.

farm yards during the ſummer ſeaſon; but this has moſtly been done without any diſtinction of their kinds or ages. But the improved practice is to ſeparate thoſe that are advanced in their growth to one half or more from the ſows and young pigs, turning and confining them about the latter end of May on the clover,

Profits on Fatting Land, allowing 10s. *Profit for each Sheep.*

ONE ACRE.

	£.	s.	d.
Winter, 2 barren ewes, off in May	1	0	0
Summer, 5 wethers, off at Michaelmas	2	10	0
Wool of 7 ſheep, at 12l. per pack	2	2	0
One bullock to fat	3	0	0
	8	12	0
Rent	1	10	0
Expenſes	0	5	0
Aſſeſſes and taxes	0	5	0
	2	0	0
Clear profit	6	12	0

ONE ACRE.

Three wethers, on at Michaelmas	1	10	0
Two ditto, in May	1	0	0
Wool	1	10	0
One bullock to fat	3	0	0
	7	0	0
Brought from bottom	7	0	0
Rent, &c. as before	2	0	0
Clear profit	5	0	0

Profits on Breeding Land.*

ONE ACRE.

Winter, 2½ ewes and 3 lambs, at 14s.	2	2	0
Wool of 2½ ewes	0	13	0
Wool of 3 lambs	0	4	6
Wool of one teg	0	4	0
The ſummer improvement of do.	0	5	0
Joiſt bullock keep	0	10	0
	3	18	6
Rent	1	0	0
Expenſes	0	5	0
One in twenty loſs by deaths	0	7	0
	1	12	0
Clear profit	2	6	6

On the firſt of theſe ſtatements it is remarked that the year was favourable for vegetation; and that ſuch profits could not probably be made ſeven years together, which is the moſt accurate method of calculating profits on land. There being no aſſeſſes on the land alſo makes it more profitable.

In regard to the profits on fattening land two methods are given; the firſt means uſed by the beſt graziers; the other, the moſt common: ſome take bullocks in to keep, others buy runts; the profits of which muſt depend on their judgment; but 3l. is the *medium* profit between the whole: 10s. each ſheep is generally allowed as the gained profit by fattening. The writer obſerves, that "it cannot be ſuppoſed that this profit will always amount to ſo much, as the years differ; therefore dry ſeaſons will abate it, and a large tract of land cannot have the ſupply of ſtock to make it ſo great. There are loſſes to be taken out; but, upon the whole, it is *very* profitable, as the expenſes are ſo *moderate*, as one ſervant man can manage a thouſand acres of paſture land. The value or rent of land is put too low, except for long leaſes unexpired, or where a large quantity of land is taken. The average price of rent is from 40s. to 3l. for fattening land, unleſs four or five hundred acres of breeding and fattening, perhaps about 30s.; and ſome old leaſes 1l. breeding land."

There are other modes of grazing in which the ſame author has formed eſtimates; but they muſt vary ſo much by circumſtances as to be of little uſe.

* Inferior breeding land maintains 2½ ſheep on an acre during winter, but good breeding land always three.

chicory, or other ſimilar crops, without ſuffering them to return to the yards to be fed with other ſorts of food, water being provided for them in the fields.—They are let remain on theſe paſtures till the beginning of the autumn, when they are found to return in excellent condition for being put to fatten. Herbage of theſe kinds is found not only to agree perfectly with them, but to promote their growth in a remarkable manner. But, much as this ſyſtem of management has by ſome been extolled, there ſeems to be one principal defect in it, which is that of the loſs of the manure, a circumſtance of great importance to the farmer. The practice would, therefore, probably be improved by having the yards connected with the paſtures, and well littered down, or, where on an extenſive ſcale, cheap temporary yards made for the purpoſe and kept in litter for them to retire to and evacuate themſelves in during the night by being ſhut up in them. In this way vaſt ſtores of manure would be produced, which muſt otherwiſe be in a great meaſure loſt, and at the ſame time the thriving of the hogs be promoted by their being kept more warm and ſheltered in the night. By this management the farmer has great advantage, in being left at full liberty to convert the whole of his other ſorts of food to the ſupport of the young and breeding ſtocks. But, profitable as this practice may be, it would ſeem to be leſs ſo than that of ſoiling them in properly-prepared yards, eſpecially where they are left in the fields without being confined during the night.

Soiling and Stall-feeding.—Beſides the above, there are other ſyſtems of feeding and fattening animals that ſeem properly to come under conſideration in this place, ſuch as thoſe of *ſoiling* during the ſummer ſeaſon with various kinds of luxuriant green vegetable crops, and *ſtall-feeding* in the winter months with roots, cabbages, turnips, and other ſorts of food of a ſucculent nature, in combination with various kinds of dry meat. The former of theſe modes appears to have had much leſs attention beſtowed upon it than its utility and importance would ſeem to demand. Without attending ſufficiently to the economy and advantage of the practice, it has been the common huſbandry in almoſt every part of the iſland to allow all ſorts of neat cattle to be grazed in the paſtures. In ſome caſes of improved farming it has indeed been lately purſued in ſome degree in the ſtable, but without being applied to the cattle ſtock. The principal circumſtances that recommend this ſyſtem of practice, are thoſe of the food being conſumed with much leſs waſte, and of courſe going vaſtly further than when fed upon the land; the great increaſe of good manure that is produced, and probably that of the ſtock feeding with leſs interruption and inconvenience, in conſequence of their being more effectually ſhaded from the heat of the ſun and better protected from the haraſſing attack of flies. In all theſe

points, this method would indeed ſeem to have a vaſt ſuperiority over that of letting the animals range over the paſtures. It has, however, been objected againſt this ſcheme of feeding, that the expenſe of conducting the buſineſs is too conſiderable. The experiments of Mr. Mure, which were conducted upon a very extenſive ſcale, as well as thoſe of Mr. Young, ſhow that this with the care of the cattle may be performed at an expenſe in proportion to each, that can never afford any ſolid argument againſt the practice*. It has likewiſe been ſometimes contended, in oppoſition to this management, that ſuch part of the ſtock as are in milk do not afford it ſo abundantly as when fed in the paſtures. This is, however, probably a mere ſuppoſition, unſupported by facts; at leaſt we have not met with any well-conducted experiment that has proved its truth, and it is obviouſly at variance with the experience we have of the effects of ſuch ſorts of green food, in other caſes; for it has been, we believe, almoſt invariably found, that moſt of the green crops that are cut and employed in this way have greater effect in exciting the ſecretory organs and promoting their ſecretions than the common paſture graſs. And it is generally allowed that the urinary ſecretion is greatly augmented in all caſes of this ſort of feeding, ſo as to conſtitute one of its advantages. But as particular ſorts of vegetables, as well as other ſubſtances, act more powerfully on ſome of the glandular organs than others, it is evident that ſome kinds of plants may have a greater tendency to promote one kind of ſecretion than another, and on this account cows fed on one ſort of food, in the practice of ſoiling, may afford leſs milk than on another †.

The practice of ſoiling has alſo been oppoſed, on the ground that the animals do not thrive ſo well as when grazed in the paſtures. But when it is conſidered that the more quiet and free from diſturbance cattle are kept, the better they in general thrive and improve in their fleſh, it is not probable that green food, when properly conſumed in the ſheds of a farm-yard, will be leſs advantageous in promoting the growth and fattening of ſtock than when eaten in the field, where expoſed to the great heat and the conſtant attacks of flies, and of courſe kept in a continual ſtate of reſtleſsneſs and inquietude. Beſides, in the experiments noticed above, the cattle were found to go on better than ſtock of the ſame kind fed in the paſtures in the moſt favourable ſeaſons for the purpoſe of grazing. And in many trials, carefully made by Mr. Young, and detailed in the Annals of Agriculture, the reſults were the ſame. The ſuppoſition of the cattle not thriving ſo well under this ſyſtem does

* Annals of Agriculture, Vol. XIV.

† A ſet of well-conducted experiments made in theſe different views would probably lead to much uſeful diſcovery in reſpect to the feeding, fattening, and milking of animals.

not therefore appear to be well ſupported by facts, or to have had any foundation in the experience of farmers.

The ſuperiority of the ſoiling method in reſpect to the economical conſumption of the food cannot be diſputed. In various experiments that have been made in proof of the great ſaving in this way, it has been found to go from twice to four or five times as far as when fed on the land; and in ſome trials it has been a great deal more. With graſs, clover, lucern, and tares, in the trials of an able cultivator, three times as many cattle were found capable of being ſupported in better condition than in the paſture mode of feeding *. But in thoſe of other experimenters it has been ſhown to be equal to five, ſix, or even more times, as we have already ſeen in ſpeaking of clover. In the field, it is obvious that great waſte muſt be committed by the graſs being trampled down, dunged upon, and in many other ways, eſpecially where a great number of cattle are paſtured together, moſt of which are avoided in the ſtall method: but it has been remarked that it is "an error to ſuppoſe that all the waſte is in feeding in the field and none in the ſtalls: there is on the contrary a waſte in ſoiling," as in caſes where the tares become podded, from the butt ends of the plants being coarſe and in a ſtate of decay, by lying on the ground, and of courſe rejected by the animals: the ſame thing alſo occurs with lucern when in bloſſom. In the heating of the food by its remaining heaped together, loſs may likewiſe be ſuſtained †. Proper management in reſpect to the crops and the manner of employing them, as we ſhall ſee below, will, however, in a great meaſure, prevent waſte in this method.

But whatever the waſte in theſe different ways may be, the various trials recorded in the Annals of Agriculture clearly demonſtrate that a vaſtly increaſed ſtock may be kept upon the ſame extent of land in the method of ſoiling, over that of the common mode of grazing the cattle in the fields.

The great point however, in which this practice excels that of paſture feeding, is, probably, in the immenſe quantity of excellent manure that is raiſed and provided for the production of increaſed crops of various kinds, and the additional improvement of the lands; while in the ordinary one ſcarcely any thing is contributed in this way, from the dung being ſcattered about the fields and diſſipated by the heat of the ſeaſon, flies, and other cauſes. In ſhort, it would ſeem injurious rather than

* Cloſe in Communications to the Board, Vol. III. † Annals of Agriculture, Vol. XIV.

uſeful, from its blanching and tendering the graſs plants in the ſpots where it remains, which are long in recovering and producing good graſs again. Soiling with green food in ſummer is a method admirably calculated for producing an abundance of manure; as from the great increaſe in the urinary diſcharges in the conſumption of green food in this way, and the heat of the ſeaſon, the littering material, whatever it may be, is ſpeedily converted into manure; by which means, with proper attention, vaſt ſtores of dung may conſequently be raiſed, where there would otherwiſe be none; which is a circumſtance of the greateſt importance, and which abundantly ſhows the great utility and ſuperiority of the practice. By theſe means the ſummer produce in manure may, probably, be made to exceed that of the winter, and at the ſame time be ſuperior in quality, as there is reaſon to ſuppoſe, that the manure produced by any kind of cattle fed in the ſame way, when not in a ſtate of fattening, is much better in the ſummer than in the winter ſeaſon. The proportion of valuable manure that the careful farmer may be capable of providing by this ſyſtem of management is ſcarcely to be conceived, except by thoſe who have been in the practice. In this view it is of much importance to have reſervoirs for the reception of the urine, in order that it may be occaſionally thrown up over the litter, and thereby promote its more ſpeedy converſion into manure. The manure afforded by fattening animals, ſuch as hogs and neat cattle, is in all ſeaſons of a rich and valuable quality.

In order to enſure the fulleſt benefit and advantage from this ſyſtem of management, the moſt ſtrict attention is neceſſary to different circumſtances; ſuch as thoſe of having convenient ſheds and yards for the purpoſe; the providing ſuitable crops in proper ſucceſſion to the proportion of ſtock to be kept; the feeding and managing the animals in a proper manner; and the making a full proviſion of materials for the purpoſe of litter.

As much depends on the convenience of the yards and ſheds, both in reſpect to the economy of labour in feeding the ſtock and the making of manure, care ſhould be taken to have them upon ſuch plans as may afford the greateſt advantage in theſe ways. It has been a practice ſuggeſted by ſome, in order to ſave the labour and expenſe of cleaning and feeding, to have the cattle in this management left looſe in the yards ſo as to conſume the food from racks or cribs, the bottoms of the yards being prepared by marl or other ſimilar materials, and a coat of litter applied, ſo as that the urine may be retained, and contribute to the converſion of them into manure.

but a better method is probably that of having them tied up in ſtalls in ſheds for the purpoſe; for though ſomething may be gained in the former mode in the labour of cleaning, the latter has conſiderable ſuperiority in the goodneſs of the manure, and in the animals being kept more quiet and leſs expoſed to diſturbance from flies*. In the firſt method the ſtock ſhould always be ſorted, and thoſe of the ſame age or ſize be fed together. A cultivator of much experience ſoils his horſes in cheap thatched ſheds in which they have room to walk and roll; and his bullocks and cows in ſtalls ſeven feet wide, each ſtall holding two head of cattle, which are faſtened by the necks to the ſides of the ſtall, by which they are prevented from inconvenienceing each other†.

That the farmer may enter upon this management with the greateſt advantage, it will be requiſite for him to attend to the culture of ſuch various crops as can be beſt applied in this way, on a ſcale amply ſufficient for the purpoſe. In the view of early application, a full proportion of lucern ſhould be raiſed on the moſt deep and fertile ſoils; and on the better ſorts of the lands that may be in the condition of fallow, clover and tare crops may be grown. Theſe muſt be ſown ſo as to come into uſe at different times; the firſt crop of winter tares ſucceeding to the early cut lucern; the later put in winter tares following, after which the clover will moſt probably be ready, to which the third crop of tares and the ſecond cut of lucern may ſucceed. At a ſtill later period the ſpring tare may be employed; and in ſucceſſion to this the third cutting of lucern will in general be ready. There are many other plants that may perhaps be made uſe of in this way. It will be ſeen from what we have obſerved on chicory, that it may be had recourſe to with advantage in this management; as in ſoils that are tolerably fertile it admits of repeated cutting. With theſe different crops, there will probably be ſeldom any neceſſity for the uſe of common cut graſs, though this may be employed if there ſhould be occaſion.

On the mode of conducting the buſineſs of foddering the animals in this practice a great deal depends. One great object is never to ſuffer them to have too much at once, as when this is the caſe, from the heat of the ſeaſon, it quickly takes on a degree of fermentation, and is rejected, or only picked among by the cattle; in conſequence of which much waſte may be committed, which would otherwiſe be avoided ‡. But, beſides this, it is not improbable but that the ſtock may thrive better by having their food more frequently, and of courſe in a more freſh ſtate.

* Annals of Agriculture, Vol. XIV. † Cloſe in Communications to the Board, &c. Vol. III.
‡ Annals of Agriculture, Vol. XIV.

And it ſhould never on any account be left packed in the carts for any length of time. The beſt mode would ſeem to be that of adapting the ſize of the cart to the exact conſumption of the ſtock, as in this way the whole may be conveniently diſtributed in the cribs or racks at once, the moment it is wanted, before it becomes unpalatable by fermentation, and the leaſt poſſible loſs be incurred. It is conſtantly neceſſary to watch the conduct of labourers in this particular, as they are in general much diſpoſed to overfeed. There is another matter in this ſort of feeding that ſhould not be diſregarded, which is that of not ſuffering the crops that are uſed in ſoiling to advance to too great a head, as by attention in this reſpect the food may be more cleanly eaten up.

In this ſyſtem litter becomes an object of the greateſt importance; as the large quantity of urine that is made by cattle when ſoiled on theſe luxuriant ſorts of green food is capable, by its moiſtening property, of aiding, in the hot ſeaſon, the more quick fermentation of ſuch materials, and of reducing a very large proportion into the ſtate of manure. In this view, the attentive farmer ſhould therefore make an abundant proviſion in the winter time of other ſorts of materials, where a proper ſupply of ſtraw cannot be reſerved for the purpoſe. There are various matters that may be made uſe of in this intention, ſuch as ſtubble, fern, ruſhes, and other aquatic plants, which may be cut and raked together in the places in which they are moſt abundantly produced, in order to be ſtacked up for future uſe. Leaves might alſo in woody ſituations be uſeful for the ſame purpoſe. And in addition to theſe vegetable matters there are other ſubſtances that are capable of being employed with utility, ſuch as peat or bog earth, freſh vegetable mould, ſand, and the ſcrapings of roads; as during the decompoſition of the various vegetable materials made uſe of in this practice, not only much hydrogen and carbonic gas is ſet at liberty, but ammonia is formed in large quantities in the manner that has been already explained, which, from its action upon ſuch earthy materials, is highly uſeful in bringing them into the ſtate of manure.

There can ſcarcely be any doubt of the advantage of this mode of management, where that cloſe ſort of attention which is requiſite in moſt of the operations of farming is beſtowed: but in order to the complete ſucceſs of the practice, it is abſolutely neceſſary that the cattle be kept perfectly clean and free from all ſorts of dirt, in the cribs, racks, or other places; that there be plenty of pure water for them to drink whenever they are diſpoſed; that the green food, of whatever ſort it may be, is given to them frequently in due portions, without its becoming injured by

keeping; and that they be turned out into the open air for a few hours in the cool of the evening during the ſummer ſeaſon, and in the middle of the day when the weather becomes more cold. It might alſo be of additional advantage, where different kinds of green food can be eaſily provided, to vary them occaſionally. By theſe means the thriving of the animals may be the moſt effectually ſecured.

This kind of management is equally applicable to cattle, hogs, and horſes; with the laſt it has however been the moſt common.

It is obvious, that by a judicious attention to this ſyſtem many advantages may be derived to the farmer. It admits of greater extents of land being kept under both the plough and the ſcythe. And in the keeping of both cows and horſes the ſaving in this method forms an object of vaſt importance.

In the winter fattening of animals, different methods are purſued in different diſtricts: in ſome it is the prevailing practice to conſume the food upon a dry ſound piece of land, to which it is conveyed for the purpoſe. It is evident, however, that this mode can only be had recourſe to, eſpecially with heavy ſtock, where the nature of the ground is ſufficiently dry to prevent injury being done by poaching, which is the caſe only on very few ſoils in the winter ſeaſon. In ſome caſes, eſpecially with turnips, the crop is eaten on the land where it grows, the cattle being turned upon it. This is a practice that occaſionally takes place in Norfolk with the leſs perfect managers. It is a great objection to this mode, that the quantity of valuable manure that might otherwiſe be produced is in a great meaſure loſt by being ſpread about in the field. And it is probable that the ſtock does not thrive ſo well from being more expoſed to the weather and kept leſs warm and quiet than in other methods. With ſheep this huſbandry may be leſs exceptionable, eſpecially where the crops are drawn and put upon a cloſe fed dry paſture, as great improvement of the land may be effected without the danger of injury by poaching.

There is another practice often adopted in fattening cattle in the winter, which is that of confining them to the yard, and letting them have their food in troughs or boxes for the purpoſe in open ſheds. This, though a better method than that juſt noticed, is probably, from the ſtock being left too much at liberty, leſs advantageous in the point of fattening than that of wholly confining them to the ſtalls, or what is uſually termed *ſtall-feeding*, as by this means they are kept more quiet, and free from interruption, and of courſe feed more quickly, and with greater regularity; which ſeem to be points of great importance in this ſyſtem of management.

The ſubſtances that may be employed in the way of winter fattening animals are very numerous; but the principal of the more ſucculent kinds are carrots, parſnips, potatoes, cabbages, turnips, grains, &c.; and of the more dry ſorts, oil-cake, oats, barley-meal, rye-flower, bean-meal, and other ſimilar materials, with various ſorts of ſtraw cut into chaff by means of machinery. In the application and management of theſe articles, conſiderable care is neceſſary to enſure their fulleſt effect. For as the art of fattening, whatever the nature of the animal may be, would ſeem to depend in a great degree on regularly keeping up the excitement of the ſyſtem, by the uſe of ſuitable rich food, to that high pitch that tends towards indirect debility, which is probably the point moſt ſuitable for inducing reſt and a diſpoſition to ſleep, which experience has ſhown to be the conditions the moſt favourable to the depoſition of the fatty material in the cells of the adipoſe membrane; it is obvious that the fattening proceſs may be greatly accelerated or retarded by the method of diſtribution that is adopted in reſpect to the food. If much nice attention be not beſtowed in this way, great loſs may be quickly ſuſtained, eſpecially where the more expenſive ſorts of dry food are made uſe of. On the ſame principle of promoting the full and equal excitement of the ſyſtem, it will be of the greateſt utility and importance not only to keep the animals warm, perfectly clean in themſelves, and free from all kinds of filth; but alſo their ſheds, ſtalls, mangers, troughs, or other places from which they take their food; as by ſuch means that conſtriction of the hide which is the ſure indication of their not thriving in a proper manner, may be avoided, and at the ſame time that diſguſt, which probably ariſes in conſequence of the parts of the food left upon the places where the cattle feed taking on or running into a ſtate of fermentation, be prevented; and of courſe, the feeding of the animals proceed in the moſt expeditious and uninterrupted manner. And where both moiſt and dry food are given at the ſame time, it may be neceſſary, in the view of promoting the more quick fattening of the cattle, to combine them in ſuch proportions, according to the conſtitutions of the animals, as that the too laxative effects of the former may be kept in order by the conſtipating powers of the latter; and thus a due balance be preſerved, which is the ſtate moſt adapted to the purpoſe of fattening. But beſides this effect, the combining of dry food with thoſe rich and juicy ſubſtances, which have their nouriſhment in a cloſe or concentrated ſtate, may be advantageous in another point of view, which is that of affording a due degree of diſtention to the ſtomach, a condition that is alſo probably neceſſary to the expeditious fattening of animals. Without

this, that ſort of fulneſs or ſatiety which induces the animals to take their reſt cannot, perhaps, be ſo completely produced. It is on this principle, that in man a full meal cannot be made on fleſh meat alone without the aſſiſtance of bread, or ſome other ſimilar ſubſtance. On this ground, hay or cut dry meat muſt therefore be conſtantly uſeful in ſtall feeding, with ſuch rich roots and plants as are not capable of being employed ſo as to produce the neceſſary degree of fulneſs.

In order to accompliſh theſe different objects in the moſt perfect and effectual manner, it is eſſential that the cloſeſt attention be beſtowed by the farmer to ſee that the ſtock, whether foddered in open ſheds or tied up in ſtalls, be regularly fed, adapting the proportion of food employed each time to the ſtate of the digeſtive organs of the animal; cautiouſly avoiding, as much as the nature of the buſineſs will admit, either giving too much or too little, as from both extremes injury may be produced: but it is better, as fattening animals are very nice, to let them have rather too little than too much; for, where any diſguſt is occaſioned, they never feed ſo well afterwards. It is uſeful alſo, on the principle formerly explained, to vary the kinds of food frequently, ſo that there may be leſs danger of their loſing their beneficial effects. This circumſtance is much attended to in other countries: fattening ſtock that is neglected in theſe reſpects never ſucceed well, or afford the farmer a juſt profit. It is conſequently of vaſt importance to have this buſineſs conducted by a perſon accuſtomed to the practice. The cattle ſhould likewiſe be kept conſtantly free from ſtanding in any ſort of dirt, by having the dung daily removed, and their ſtandings ſwept out quite clean, and well littered down with dry clean litter of ſome of the kinds that have been already recommended, ſo as to prevent any ſort of naſtineſs from adhering to their ſkins.

To do this completely, as much ſhould be made uſe of as can be converted into manure, probably the proportion of from one to two or three tons to a beaſt may not be too much, as the dung will amply repay its expenſe in the improvement which it affords to the lands. And by this, with the above means, all ſorts of diſguſting ſmells may be wholly removed. It is alſo uſeful in the intention of fattening to have the animals ſheltered and kept in a due degree of warmth, without being too hot; as, where the heat is conſiderable, there may be diſadvantage by too much perſpiration being excited. Where it is neceſſary to make uſe of cut dry meat, the beſt practice is probably that of keeping ſome of ſuch food always in the cribs or mangers, ſo that the animals may be induced to take it at pleaſure.

The buſineſs of fattening in the ſtall, or the farm-yard, uſually commences on the decline of the paſture and after-graſſes, towards the latter end of October, continuing through the whole of the winter, until about the beginning of May. When ſucculent food is made uſe of with cut dry meat, which is in general a more profitable method to the farmer than that of having recourſe to corn and oil-cake, carrots, parſnips, and potatoes would ſeem to ſtand the higheſt as articles for this purpoſe; cabbages and turnips having been found inferior in their fattening qualities; the two firſt are equal to almoſt any ſort of food in this view, being capable of fattening large cattle. The moſt general practice is to uſe theſe roots and plants without any preparation, except that of being ſometimes cut, ſliced, or chopped, giving only a ſmall proportion at once, three or four times in the courſe of the day, in cribs or mangers properly contrived for the purpoſe; proper ſupplies of cut ſtraw in mixture with hay being in moſt caſes provided and given in the intervals of ſuch feeds. In this method leſs water will be required than when dry meat is wholly made uſe of. This mode of feeding muſt be purſued with as much ſteadineſs and regularity as poſſible, varying the kinds of moiſt food occaſionally where it can be conveniently done. A great deal of the ſucceſs of the practice reſts upon proper attention to theſe circumſtances. Some have ſuppoſed that great advantage may be derived from the application of fire in the preparation of ſome of theſe roots for the feeding of the animals. In the trials of an intelligent cultivator*, turnips were found to anſwer well in the feeding of cows in combination with cut chaff when prepared by means of ſteam; and in various experiments, detailed in the Annals of Agriculture, potatoes have been found to be better ſuited to the feeding of horſes and ſome other animals by undergoing the ſame proceſs†. This mode of preparation is probably much more neceſſary in the potatoe than the turnip, as we believe, from trials that we have made, that they not only agree better with the animals, but are more fattening when given in this ſtate. Beſides, there is much leſs loſs ſuſtained in the operation of ſteaming in the potatoe than the turnip. However, as there muſt conſtantly under this mode of preparation be a conſiderable expenſe in labour and fuel, it is better to avoid it wherever the nature of the vegetables will admit of being made uſe of in their raw ſtate, which is certainly the caſe with the turnip and ſeveral other vegetables noticed above.

* Rev. Mr. H. Cloſe.

† An excellent *apparatus* for this purpoſe, contrived by Mr. Stares, is deſcribed and repreſented by a plate in the Eighteenth Volume of the Annals of Agriculture.

The proportions of thefe different forts of food that an animal will conſume in any given time cannot be eaſily aſcertained, as much muſt depend on circumſtances—the modes of feeding, the ſize of the animal, the nature of the ſeaſon, and various other cauſes.

In ſome trials carrots have been found to be conſumed in the proportion of about ten ſtone per day for an ox of ſixty ſtone, cut chaff or hay being given in addition *. As the parſnip contains an equal if not larger proportion of the nutritious principle, nearly a ſimilar quantity of that excellent root may be neceſſary; but we believe experiment has not yet ſhown the exact difference in the fattening properties of theſe two roots. The latter can however only be cultivated to advantage on a deep rich ſoil; but in ſuch caſes it ſhould never be neglected. An acre of either of theſe roots would complete the fattening of two ſuch beaſts as the above, if taken from the paſtures in a half-fattened condition. Theſe two roots and the potatoe, probably, approach the neareſt that of oil-cake in their fattening properties, but are certainly inferior to that ſubſtance.

The experiments made on potatoes in the intention of fattening animals have been ſufficiently numerous to ſhow that they are capable of that application with great advantage. In the trials of Mr. Abdey, with ſmall Welſh and Scotch runts, the conſumption per day was about a buſhel each, given in their unprepared ſtate, with a quarter of a truſs of hay. Their powers of fattening in theſe trials appear to much advantage. When given in their raw ſtate, hay or ſome other ſort of dry food is, however, conſtantly neceſſary to correct their laxative quality. And when given after being prepared by fire, it is the practice of many to mix them with cut chaff.

Where the cabbage is made uſe of, the conſumption is in general found to be ſomething leſs than one-fifth the weight of the animal in the courſe of the day: therefore an animal weighing ſixty ſtone conſumes in the ratio of twelve ſtone each day. In the trials of Mr. Turner, an ox of eighty ſtone was found to eat fifteen ſtone of cabbages with half a ſtone of hay. And in reſpect to their power of fattening, it was found that oxen put to them in low condition about November became in a ſtate of fatneſs fit for ſale in the following March, weighing eighty ſtone; uſually improving in the courſe of four months in value about five pounds ten ſhillings †. In this proportion, an acre of thirty tons of this crop would be adequate to the fattening of three beaſts of the above ſize.

* Annals of Agriculture, Vol. XXXII. † Turner in Young's Six Months Tour, Vol. II.

Grains can only be made uſe of in this way in particular ſituations, as near large towns, where they can be obtained at a reaſonable rate. Thoſe procured from diſtilleries are found the moſt beneficial in this uſe. The quantity made uſe of for moderate-ſized beaſts is uſually from a buſhel to a buſhel and a half, three times in the courſe of the day, hay or cut dry food being given between the periods of feeding with theſe ſubſtances. Grains ſeem to be much leſs powerful in their fattening properties than any of thoſe articles that precede them.

But turnips, though very frequently employed in this manner, are greatly inferior to cabbages, as, beſides their being more liable to injury, they probably poſſeſs the fattening property in a leſs degree than any of the ſubſtances that have been mentioned. The proportion in which they are conſumed by the fattening animals has by ſome been found to be ſomething more than a-third of their weight, but by others about a third in the day *. In other experiments, an ox of from ſeventy to eighty ſtone has been aſcertained to eat ſomething leſs than three hundred weight in the courſe of the day, beſides chaff and hay; and ſmall cows of about thirty ſtone, one hundred weight and three quarters in the ſame ſpace of time. An experienced agriculturist has found, that when conſumed in ſtalls or ſheds, an acre of good turnips will "completely winter-fat an ox of fifty ſcore," beſides affording manure for an acre and a half of land; but if fed upon the land, two acres will not fatten one ſo well, and the dreſſing will be partial and of little value †. Much dry food is conſtantly neceſſary during the uſe of this ſort of food in order to the expeditious fattening of the animals.

The turnip is often employed in the fattening of ſheep; and in this application it is frequently advantageous, where the management is conducted with judgment: but to derive the greateſt profit from this practice, it is probably the beſt method to only make uſe of them for ſuch ſheep as are in a conſiderable ſtate of forwardneſs; as ſuch as are poor when turned to this ſort of food are ſeldom found to pay well for it. Every farmer who has applied turnip crops in this way muſt have found this to be the caſe. Where the ſoils are ſufficiently dry, the beſt method of conſuming them may be on the lands, by means of hurdling; but, under the contrary circumſtances, they may be drawn and eaten upon a dry piece of ſward. It is the practice with good farmers, in many caſes, to have recourſe to oil-cake, oats, barley-meal,

* Baker's Experiments and Kames's Gentleman Farmer.

† Cloſe in Communications to the Board, Vol. III.

pollard, bran, malt-duſt, and other matters of the ſame ſort for the fattening ſheep when at turnips; as by theſe means the watery quality of that food is corrected, and the fattening of the animals, of courſe, much promoted. It is perhaps only the beſt ſort of ſheep that can repay the expenſe of this ſyſtem of fattening. Theſe articles are not however abſolutely requiſite in the fattening of ſheep on this root, as vaſt numbers are made fat without them; but they greatly promote the proceſs. And it is often uſeful to have recourſe to other ſorts of dry food with them, ſuch as hay, cut chaff, or other ſimilar ſubſtances, which ſhould be placed in racks, cribs, or troughs made for the purpoſe, the latter of which ſhould be ſo guarded by boarding as to prevent the wind from blowing ſuch light ſubſtances out of them. There is another point that deſerves attention in the fattening of ſheep on turnips, in order to prevent the waſte which muſt otherwiſe be incurred, which is that of letting the portions of turnips that are left by the fattening ſtock be cleanly eaten up by lean followers.

Of the dry kinds of food employed in the fattening of cattle, there is, perhaps, none equal to *oil-cake* in the property of fattening. It is, however, linſeed-cake that muſt be employed in this way. The late advances in the price of this article have probably rendered it incapable of being made uſe of with much profit except in particular caſes, and where manure is a principal object. With this ſort of food, as well as thoſe that have been noticed above, it is alſo the common practice to give ſome other ſort of meat, ſuch as hay, cut chaff, and other ſubſtances of the ſame nature. In this mode of fattening, ſome begin by giving, to a beaſt of a hundred ſtone, two cakes per day, of about ſix pounds each, for ſix or eight weeks, and then increaſe them to three, till the animals become fat *. In addition to the cake, from half a ſtone to a ſtone of hay is given each day: the whole conſumption in cake being about 21 cwt., and in hay 26 cwt.; which, at the prices previous to the late advance on theſe articles, rendered the expenſe of winter-fattening an animal of the above ſize ſomething more than ſeven guineas. Lean cattle of the ſmaller kinds have been made perfectly fat in the courſe of eight or ten weeks by this ſubſtance, in the trials of Mr. Moody †. The cake, in this application, is broken down into ſmall parts, and frequently blended with the chaff or other ſubſtances that are made uſe of with it. On the continent, according to Mr. Young, linſeed-cake is ſometimes exhibited in a liquid ſtate, being diffuſed in hot water and drunk by the cattle, hay and other ſubſtances being given at the ſame time. In the Lincolnſhire Report a method is ſuggeſted,

* Annals of Agriculture, Vol. XXXII. † Young's Eaſtern Tour, Vol. I.

of giving cake to cattle while in the paſtures, in a ſmall proportion, with great ſucceſs; a practice which may be applicable where the cake-fed beaſts are not fully fattened for ſale in the early ſpring months. It is an advantage in fattening with this and other ſimilar ſubſtances, that the animals may be completed with them at much more advanced ages than in other modes.

The uſe of linſeed-oil and bran has been attempted on the ſame principle as that of cake, but probably with leſs ſucceſs. The conſumption in this method for beaſts of the ſmaller ſize is ſomething more than half a peck of bran three times in the day, with a third of a pint of linſeed-oil well ſtirred into it; with this good hay or cut chaff is uſually given. This method is attended with more trouble than that of cake-feeding, without any ſuperiority in the effect. It can only be employed when the oil is cheap.

When ſheep are fattened with cake, they require it to be reduced into a much finer ſtate than for beaſts, and it may then be mixed with bran or other ſimilar ſubſtances, and put in the troughs or cribs.

Oats are excellent for ſtall-fattening cattle, but the price has lately been too high for their being made uſe of to any extent in this way. They are moſtly given in the ſtraw when applied in the fattening of cattle.

Bran, in mixture with pea or other ſorts of meal, had likewiſe been found uſeful in ſtall-fattening, as well as barley and other meals, in combination with various ſubſtances of other kinds; but their uſe muſt conſtantly be regulated by the prices which they bear at the market. When materials of this ſort are employed, it will be found particularly neceſſary, on the principles that have been already explained, to let the animals have a plentiful ſupply of hay or cut chaff.

It has long been contended by ſome, that food in the ſtate of acidity is the moſt advantageous in the feeding and fattening of ſwine, while others have as ſtrenuouſly maintained the contrary poſition. The point has not, however, ſo far as we know, been fully decided by any fair experiments. That there may be ſomething in it, ſeems probable from the circumſtance being ſo frequently noticed, and from Mr. Young having found the ſame principle applied in the fattening of cattle in France, where they finiſh the proceſs by the uſe of ſour rye paſte, brought into a liquid ſtate by the addition of water, and afterwards rendered ſufficiently thick by ſome kind of cut meat. The principle on which this depends ſeems involved in ſome difficulty; as it has been long a popular notion, that acids have a directly contrary tendency. It would appear, however, not

improbable, but that acid ſubſtances may have ſome power in ſtrengthening the digeſtive organs, and thereby promoting the conſumption of a larger proportion of food in a given time, in conſequence of which the animals become fat more quickly.

Beſides theſe ſubſtances, various others have been employed in particular ſituations for the purpoſe of fattening animals. The waſh of malt-diſtilleries, which has long been principally employed in the fattening of hogs, has now been found applicable in the ſtall-feeding of cattle. The method of uſing it is in conjunction with ſome farinaceous ſubſtances, ſuch as thoſe that have been already mentioned. It is then given in ſmall proportions, three or more times in the day: a little hay or ſtraw being given them to enable them to chew the cud*. On the principles explained above it is probable, however, that ſuch dry kinds of food might be made uſe of more fully with advantage. In the Weſt Indies, Mr. Millington found molaſſes to poſſeſs an expeditious fattening quality, when joined with other articles of the common food of cattle. It was made uſe of in his trials in the proportion of from half a pint to a pint, twice a day, in mixture with different farinaceous or mealy ſubſtances; and, where theſe were not in uſe, with various kinds of dry food, ſuch as cane-tops, and guinea graſs well dried by expoſure to the ſun, and with oil-cake. Theſe are moiſtened with the ſame quantity of molaſſes, to which water with a little ſalt is added †. With theſe articles a little hay, or not too ſucculent green fodder, was employed. Their effects in fattening poor worn down oxen were found very conſiderable. They are not, however, from their great expenſe, capable of any general application in this way.

Whatever the nature of the food may be that is employed for the purpoſe of fattening animals in the yard or the ſtall, the greateſt care is neceſſary to ſee that it is regularly given to them, that they have it in due proportion and ſufficiently varied; that pure water be amply provided, and that they have litter ſo as to keep them perfectly dry and clean. Where this ſort of buſineſs is conducted on an extenſive ſcale, it is alſo of the greateſt utility to have a machine for the occaſional weighing of the cattle as they advance in their fattening, as without ſuch aſſiſtance it is but few perſons who are capable of judging whether they go on in a profitable manner or not. But, by weighing them from time to time, at the diſtance of every eight or ten days, in the morning before they are fed, this may be correctly aſcertained; and where they fall off, or do not advance in a ſufficient degree to the preceding weighings,

* Middleſex Corrected Report. † Ibid.

ſuch changes may be made in their food, water, and management, as are the moſt likely to promote their fattening in the moſt perfect manner*.

There is another ſcheme of feeding that may be neceſſary to be conſidered in this place, which is that of fattening lambs in the houſe for the purpoſe of early

* The following table exhibits the reſults of various experiments made by Mr. Mure in fattening cattle with different ſorts of food, in the ſtall and field, as ſtated in the 19th volume of the Annals of Agriculture.

No. & Sort of Bullocks	When weighed.	Weight.	Sort of Food.	Time fed.		Increase	Increase per Head.
		Stones.		Wks.	Days.	Stns.	St. lbs.
19 Iriſh	June 24	1650					
	July 12	1729	Tares	2	4	79	4 2
	29	1748	Mowed graſs	2	3	19	1 0
	Auguſt 29	1781	Ditto	4	3	33	1 10
1 ditto	Auguſt 30	96					
10 ditto	January 5	1024	Cabbages and hay	17	—	113	6 6
8 ditto	9	774					
		1894					
12 Iriſh	Auguſt 22	829					
1 bull		90					
12 Iriſh	January 30	983	Graſs and cabbages	24	—	154	12 11
1 bull	— —	98	Ditto	24	—	8	8 0
30 Iriſh	July 3	2146					
	31	2243	Tares	4	—	97	3 3
	September 27	2329	Graſs and cabbages	7	6	86	2 12
	November 22	2466	Hay and cabbages	8	—	137	4 7
	February	2721	Potatoes, malted beans, and hay	11	—	255	8 7
7 Highland Scots	July 5	470					
	27	468	Tares	12	—		
3 home breds	July 5	174					
	September 27	175	Ditto	12	—	1	
40 Scotch runts	23	3320					
	November 7	3537	Looſe at graſs	6	—	217	4 7
	February 20	3801	Potatoes, beans, chaff, and hay	16	—	264	6 8
10 home breds	July 11	333					
	September 28	401	Looſe in clover	11	—	68	6 11½
24 ſhort-horn beaſts	19	2522					
	October 24	2695	Looſe at graſs	5	—	168	7 0
	March 16	3057	Potatoes, beans, and chaff	20	—	362	15 2
1 bull	September 4	140	Ditto	24	—	48	48 0
2 bulls	12	165	Ditto	31	—	60	30 0
2 bulls	19	153	Ditto	20	—	28	14 0
4 bulls	22	312	Ditto	20	—	60	15 0

ſale. This is a practice which can only be undertaken with advantage in ſituations at no great diſtance from large towns, where there is great demand for early lamb.

In theſe trials various other kinds of food were employed, the reſults of which ſhow the quantity conſumed, their different advantages, and the difference in the increaſe of fleſh in the animals in proportion to their value.

No. of Bullocks.	Weight.	Quantity of Food conſumed (Length of Time 63 Days).	Value of Food.	Increaſe.
	Stones.		l. s. d.	Stones.
1,	59	4½ coombs ſteeped bean meal,	2 4 4½	8
2,	59	3 coombs 3 buſhels malted beans,	1 17 6	11
3,	59	5 coombs 1 buſhel malted barley,	2 11 0	14
4,	61	5 coombs 1½ buſhel malted beans and barley,	2 2 10	13½
5,	62	4 coombs 3½ buſhels ſteeped barley-meal,	2 8 9	13
6,	65	4 coombs 3 buſhels dry barley-meal,	2 7 6	12
7,	66	4 coombs dry bean-meal	2 1 3	14
8,	72	As many turnips as were valued at	1 1 0	11⅓
9,	76	As many potatoes as were valued at	1 11 6	11¼
10,	88	4 coombs ½ buſhel malted beans and chaff,	2 6 6	15
11,	88	4½ coombs malted barley and chaff,	2 12 1	13½
12,	89	4 coombs malted beans and chaff,	1 19 4	14
13,	92	malted beans and potatoes,	1 0 3	12
14,	128⅔	malted beans and potatoes,	1 11 1	19½

Average increaſe 13 ſtones each bullock in 63 days.

N.B. The beans and barley valued at 2s. 6d. per buſhel, and the potatoes at 6d. per buſhel.

In the following table the quantity of different ſorts of green crops per acre is ſhown, and the proportion of ſtock they will ſupport:

	tons.	cwt.	qrs.	lbs.			qrs.	lbs.
Weight of ſcarcity root from 1 acre,	19	8	3	20	— Weight of 1 buſhel,		2	1
turnips,	16	14	3	18	—		1	20
potatoes,	10	3	2	8	—		2	4
cabbages,	14	3	2	8	—		1	16

Quantity of beans from an acre 8 coombs.

	£.	s.	d.	
Expenſe of 1 acre of cabbages,	1	0	0	
potatoes,	1	7	6	
turnips,	0	6	6	ſcarcity root about the ſame price.
beans,	0	8	6	

| 1 acre of ſcarcity root will keep a middling-ſized bullock | | |

In order to conduct this ſort of fattening with profit and ſucceſs, a *lamb-houſe* or *ſuckle* of proper dimenſions muſt be provided. It is found from practice that a range of building from ſixty to ſeventy feet in length, and fifteen or eighteen in

With ſcarcity root againſt potatoes the reſults were as below:—

Food Scarcity Root.

Time.	Number, Kind, and Weight of Beaſts.	Stones.	lbs.
Jan. 17.	8 ſhort-horns weighed	963	0
	average	120	5
Feb. 28.	weighed again	1014	0
	average	126	10
	Gain in 6 weeks	6	5

Quantity of food conſumed per week by each beaſt:—One peck three-quarters of beans, and four buſhels of cut chaff 1s. 8d., and fourteen buſhels of ſcarcity root.

Food Potatoes.

Time.	Number, Kind, and Weight of Beaſts.	Stones.	lbs.
Jan. 17.	8 ſhort-horns weighed	955	0
	average	119	5
Feb. 28.	weighed again	1010	0
	average	126	3
	Gain in 6 weeks	6	12

Quantity of food conſumed per week by each beaſt:—One peck three-quarters of beans, and four buſhels of cut chaff 1s. 8d., and eight buſhels of potatoes.

The proportions between the living and dead weights in animals are intereſting to the grazier.

CATTLE.

		Stones.	lbs.		Stones.	lbs.
Iriſh bullock killed March 21, 1789.	Weight alive	92	0	Dead weight	48	1
				Hide	6	10
				Tallow	3	7
Highland Scot, killed Nov. 23, 1790.	Weight alive	81	0	Dead weight	44	0
				Tallow	4	8
				Hide	5	4
Home bred heifer, killed March 26, 1791.	Weight alive	67	0	Dead weight	35	13
				Hide	4	4
				Tallow	3	7
An ox killed April 1790.	Weight alive	103	0	Dead weight	64	10
				Hide	6	10
				Tallow	6	13

SHEEP.

Norfolk ſheep killed April 1790.	Weight alive	10	4	Dead weight	5	8
South Down ſheep killed.	Weight alive	14	5	Dead weight	7	3½
				Tallow	0	7½
Ditto killed Jan. 5, 1791.	Weight alive	14	2	Dead weight	7	2
				Tallow	0	7

breadth, with three or more coops or diviſions of different ſizes at each of the ends, for ſeparating the lambs according to their ages, is ſufficient for containing and conducting the buſineſs of from one hundred and ſixty to one hundred and eighty lambs. That the lambs may be enabled to find their mothers with facility, the ewes, when they are ſeparated from them, ſhould be kept apart by deal hurdles in the middle of the houſe, ſo that they may be convenient for the lambs in the coops at the ends*.

After theſe arrangements have been made, a ſuitable breed of ewes for the purpoſe ſhould be provided. The moſt early ewes of the Dorſetſhire breed are the moſt proper for this management. And there is another circumſtance that demands ſome attention in this ſyſtem of fattening, which is that of having ſuch ewes as produce lambs that die of a fine white colour in the fleſh, or what the butchers term *fair*.

The ewes, after being provided with due attention to theſe circumſtances, are to be carefully kept during the day-time in a warm paſture, and houſed in the night. They ſhould be fed with brewers' grains and good green rouen hay, where there is not plenty of graſs, as it is of much conſequence to keep them well before the time of lambing as well as afterwards. They uſually begin to lamb a little before Michaelmas, and when twenty or thirty lambs are dropped they may be put into and confined in the houſe. And in order to their feeding in the moſt perfect and expeditious manner, it is neceſſary that the houſe be kept conſtantly well littered with clean wheat-ſtraw. All the dirt and naſtineſs that may ariſe or adhere to the coops, hurdles, or other parts, ſhould be often carefully removed and waſhed away, as without care in this reſpect the lambs never thrive well. It is likewiſe neceſſary to provide a proper ſupply of calcined chalk, both in the lump and in powder, in order that by licking it they may correct the ſuperabundant acidity of the ſtomach, and thereby prevent the tendency to looſeneſs, and preſerve themſelves in health. And as they are apt to ſuck any thing that comes in their way, a little clean wheat-ſtraw ſhould be put, with the ear ends downwards, in a rack within their reach, for them to nibble and eat of. If there be pitch-marks on the ewes, they ſhould alſo be clipped out. The foot-rot and ſcab are likewiſe to be well guarded againſt.

The method of management that is uſually adopted in the *ſuckling-houſe* is this:

" The mothers of the lambs are turned every night at eight o'clock into the lamb-houſe to their offspring.—At ſix o'clock in the morning theſe mothers are

* Middleſex Corrected Agricultural Report.

ſeparated from their lambs and turned into the paſtures; and at eight o'clock ſuch ewes as have loſt their own lambs, and thoſe ewes whoſe lambs are ſold, are brought in and held by the head till the lambs by turns ſuck them clean: they are then turned into the paſture; and at twelve o'clock the mothers of the lambs are driven from the paſtures into the lamb-houſe for an hour, in the courſe of which time each lamb is ſuckled by its mother. At four o'clock all the ewes that have not lambs of their own are again brought to the lamb-houſe, and held for the lambs to ſuck; and at eight the mothers of the lambs are brought to them for the night.

"If an ewe gives more milk than its lamb will ſuck, the ſuperabundance is given to the twins, or to any other lamb whoſe mother may not be able to furniſh it with ſufficient food. The ſhepherd muſt in this caſe hold the ewe, or ſhe would not ſuffer the ſtrange lamb to ſuck. From their timid nature, it is extremely eſſential that they ſhould be kept free from every ſpecies of unneceſſary diſturbance*."

In order to enable the ewes to ſupport the great exhauſtion of this ſyſtem of management, they are kept plentifully ſupplied with different ſorts of green food, ſuch as turnips, cole, rye, tares, clover, and other ſimilar vegetables, and when theſe are not capable of being provided in plenty, brewers' grains are given in their place in troughs, and a proper ſupply of freſh green rouen hay in racks. This is requiſite not only for the ſupport of the ewes, but that a full ſupply of milk may be provided for the lambs and the danger of their being checked in their thriving avoided, as where the contrary is the caſe no ſort of feeding can afterwards bring them into a fattening ſtate†.

The lambs are retained in the houſes, under this method of feeding, till they are in a proper condition for the butcher; at which time ſuch as are about eight weeks old and fully fattened are drawn out for the market, which in general fetch from two to four or five guineas a-piece, according as they are more early. December and the two ſucceeding months are the deareſt, as at other ſeaſons they ſeldom fetch more than one half the price. It has been obſerved that the ſaleſmen and butchers in London find that ſuch lambs as have ſharp *barbs* on the inſide of their lips die of a deep colour, and thoſe whoſe *barbs* are naturally *blunt* certainly turn out *fair* meat ‡.

The chief objects in this ſort of fattening are thoſe of attending to the regular feeding of the ewes, the varying of their food with propriety, and keeping the houſe perfectly clean and ſweet.

* Middleſex Corrected Agricultural Report. † Ibid. ‡ Ibid.

Planting.—This is a practice which has lately been much more attended to than probably at any former period: the profit and advantage of covering different ſorts of land with trees of the fruit, timber, or other kinds, according to circumſtances, having begun to be better underſtood, and of courſe to gain a greater intereſt with thoſe extenſive proprietors who have the beſt means of carrying ſuch plans into execution.

It is obvious that on the drier ſorts of deep, friable, ſtrong, loamy, and many other ſorts of ſoil, in particular ſituations, fruit-trees of different deſcriptions, but particularly the apple and pear, may frequently be planted, when either in the ſtate of tillage or paſture, with great profit and ſucceſs. And that in the leſs deep lands, of the ſame kind, with dry rock ſubſoils, other ſorts of fruit-trees may often be raiſed with advantage: while on the ſteep unproductive waſte lands, that can neither be cultivated with much benefit under the ſyſtem of corn or graſs, trees of the timber or other ſorts admit of being planted with very conſiderable profit; often from two or three, to eight or ten times the amount which they would afford under any other method of management.

It has been well obſerved, that waſte and barren lands, in moſt ſituations, may very conveniently be improved by planting trees on them. There are few ſpots which would not admit of being brought into culture in this way, under particular circumſtances; and there are innumerable tracts, of vaſt extent, on which it would be much more profitable to the owner to plant with trees, than to attempt any other mode of improvement. "Wherever the ſoil is dry and infertile; or where its chief or only produce is heath; or where it is full of rocks and ſtones riſing to the ſurface; or if it be a ſtiff obdurate clay, having little ſurface-produce; and in general, in moſt caſes where the ſoil is poor, if not in the very near vicinity of a town, it may be converted into plantations, if it can be freed from hurtful water, with greater profit than any other improvement it could admit of, unleſs in very particular circumſtances, even where it may admit of being brought, *in time*, into cultivated ground. Where the ſurface-produce is naturally ſmall, perhaps nothing could be ſo œconomical as, *in the mean while*, to fill it with trees; becauſe theſe, if judiciouſly choſen, not only yield a greater profit than could be drawn from any other kind of produce, and afford conveniences for houſes, and other accommodations for inhabitants and for manufactures, but the ground itſelf, while the trees continue to grow upon it, undergoes for the moſt part a gradual amelioration which it would not have done in its natural ſtate, and admits of being more eaſily improved when the proprietor can find leiſure to undertake it, than it otherwiſe would

have done*." Others recommend that every inch of ſuch barren waſte lands as are not capable of cultivation by the plough †, or of being uſefully applied in the ſtate of ſward, ſhould be converted to the purpoſe of raiſing plantations, eſpecially thoſe bleak and expoſed tracts on the ſides of mountains and on the banks of the ſea. It is however the advice of an attentive obſerver, that large plantations or coppices for profit ſhould not be made on good land, always of much more value for corn or paſturage, but either on moiſt land of ſmall value, upon a clay or marl bottom, where timber often grows well, or rather where ſuch land abounds, upon precipices, and ſides of hills impracticable to the plough; and where it often happens the land unplanted is of little or no value ‡."

There are likewiſe ſituations in the more warm and leſs expoſed parts of almoſt every diſtrict which are proper for admitting this ſort of improvement, on account of their incapability of being converted to other uſes; ſuch as the narrow corners of fields in the ſtate of tillage, and the hedge-rows of thoſe in the condition of graſs.

In ſhort, there is ſcarcely any portions of land ſo poor, barren, rocky, or unproductive, as not to admit of this ſort of improvement, provided trees adapted to the nature of their ſoils and proper modes of planting be practiſed.

The limits of a work of this nature are, however, too confined to admit of fully examining and entering into the ſubject, which would fill a volume. It is only a few of the moſt uſeful practical directions that can be here brought to the notice of thoſe proprietors who have a wiſh to render their eſtates more ornamental and valuable, by the practice of planting thoſe parts of them that do not admit of other modes of culture §. In order to render this ſort of management more clear and ſatisfactory, we ſhall conſider it as applicable in the cultivation of fruit-trees, timber, and coppice, or underwood.

Fruit-Trees.---The planting of trees for the purpoſe of producing fruits of different kinds, in many diſtricts, forms a conſiderable part of the profit of the farmer. This is the caſe in Herefordſhire, Devonſhire, and other counties where

* Anderſon's Eſſays, Vol. III. † Nicol's Practical Planter. ‡ Pit in Staffordſhire Report.

§ As a proof of the great improvement that may be accompliſhed in this way, it is obſerved by Mr. Pontey, in his uſeful Tract on Planting, that an eſtate of a thouſand acres of mountainous land, uſually termed barren from the bleakneſs of its ſituation, let for not more than twelve ſhillings per acre, would coſt at thirty years' purchaſe eighteen thouſand pounds. If the purchaſer expend a thouſand pounds more in planting and fencing a hundred acres, ſo ſituated as ultimately to ſcreen the whole, allowing compound intereſt for that with the accumulating rent of the land for fourteen years, the eſtate

the buſineſs of making cider is carried on in an extenſive manner; and in the county of Kent fruit-trees are often planted with the intention of deriving profit from the produce.

In thoſe diſtricts where cider conſtitutes a principal object of the farmer, the planting of apple trees becomes a buſineſs of great importance, and requires particular care, in order to keep up a conſtant ſucceſſion and afford proper ſupplies of fruit for the purpoſe*.

It is only in thoſe ſorts of ſoil that are of the more dry kind that trees of this

would then have coſt about twenty-one thouſand two hundred pounds; and the account for it, with fourteen years beyond that period, may be ſtated as under:

	£.
Paid for the eſtate	18,000
900 acres improved by ſhelter, 3s. per acre, at 30 years' purchaſe	4,050
Value of 200,000 trees (chiefly larch) at 6d.	5,000
Eſtate worth at the end of 14 years	27,050
Coſt, as before mentioned, about	21,200
Improvement by planting	5,850
Do. by trees, in 14 years more, at 1s. each	10,000
	15,850
Deduct for rent of 100 acres, at 60l. per annum, with compound intereſt, about	1,175
Eſtate improved by planting, in 28 years	14,675

It is added, that in forming "theſe calculations full allowance has been made for the expoſure of ſituation, as it is not uncommon to ſee larch worth as much money in half the time, but probably if the whole were ſuffered to remain to the end of the term, the improvement might not be ſo great; yet if the thinning were properly attended to, the value of ſtanding trees, with the produce of ſuch as were ſold, could not be leſs than the ſtated average, independent of expenſe, viz. 1s. 6d. per tree, or 125l. per acre."

* Mr. Marſhal mentions the ſtyre apple, the Hagloe crab, the golden pippin, old red-ſtreak, woodcock, muſt, Paris or royal wilding, dymmock red, coccagee, ruſſet, and Bromley foxwhelp, as ſtill in uſe.

The ſorts of apples that have in practice been found the moſt proper and valuable for the making of good fruit-liquor in the different diſtricts, according to Mr Crocker, are the following:—

"In Herefordſhire and Worceſterſhire:—The Bennet apple; ſtreaked with red, of a pleaſant taſte, makes a good ſecond-rate cider.—Captain Nurſe's kernel; yellow, ſtreaked with red, of a mild acid flavour, makes light pleaſant cider.—Elton's yellow: of this apple there are two ſorts, the one to be met with above Hereford and the other below; the former of the ſhape and ſize of an orange, yellow on one ſide and red on the other, of a mild pleaſant acid, and makes very good cider: the latter is ſomewhat larger, and of a beautiful gold colour, ſharp to the taſte, and makes excellent cider.—Normandy apple: under

deſcription can be raiſed with advantage. It has likewiſe been remarked, by an intelligent cultivator, on an extenſive ſcale, that the fruit-liquors of Herefordſhire have "always been ſuppoſed to derive their excellence from ſome

this name there are three ſorts; the yellow, the white, and the green; all of a bitter-ſweet taſte, which make rich cider, and of a high colour: the trees are ſaid to be moſt abundant bearers. Mr. Crocker has been informed by a friend, whoſe veracity may be depended on, that thirty trees of this ſort, in the fifth year after grafting, produced five hogſheads of cider, of one hundred and ten gallons each.—Yellow or foreſt ſtyre; ſmall, red on one ſide, and a fine yellow on the other; of a mild pleaſant acid, and, in the opinion of many, makes a moſt excellent cider: the tree, however, ſeldom thrives well, and is but a ſhy bearer."

In Somerſetſhire:—"The Jerſey; ſmall, of a light red ground, with a variety of lake-coloured ſtreaks, moderately bitter; makes high-coloured cider, which is ſluggiſh in its fermentation, and ought to be made by itſelf.—White-Sour: ſmall, of a yellow ground, lightly tinged towards the noſe with a light brown, and ſome ſtrong touches of brown near the ſtem; of an acid flavour, ſomewhat acrid, very juicy, and makes ſmart palatable cider.—Margill; middle-ſized, yellow lightly tinged with red, pleaſant flavour, is a fine cider-fruit.—Vallis apple; large and handſome, finely tinged with red all over, ſweet in its flavour, very juicy, makes tolerable cider.—Barn's-Door; moderate ſize, brown towards the ſtem, the reſt red, ſome red ſtreaks within, late in ripening; a pleaſant acid; makes very good cider.—Crab red-ſtreak; ſmall, greeniſh yellow on one ſide, light red on the other, with ſtrong red ſtreaks, of a pungent acid, and under proper management makes ſmart ſtout cider—Du-ann; ſmall, yellow near the ſtem, ſtrongly tinged with red towards the noſe, ſmart acid, makes good cider.—Jack Every; middle ſize, light yellow tinged with brown and red, ſweet flavour, makes tolerable cider.—Coccagee; yellow, ſpotted with red and brown, of a rough acrid flavour, makes very ſmart cider under due management; but its fermentation being particularly volatile, it requires much attention ſoon after making.—Clark's Primo; middle ſize, of an orange colour on one ſide, red blotched with brown on the other, of a mild luſcious acid; makes rich cider, and is alſo an excellent apple for the table.—Buckland; ſmall yellow tinged with red, veined with red within, makes good cider.—Pit-Crab; ſmall, dark red finely tinged with a lake colour within, ſmart acid; makes good cider.—Slatter's Pearmain; middle ſize, yellow, richly tinged with red and brown, delicious flavour, firm fleſh, makes excellent cider, but hitherto has been more uſed at the table than at the preſs. Slatter's No. 19; long in its form, ground a yellow and light red, finely blotched with ſtrong red, moderately acrid; is a fine cider-fruit.—Slatter's No. 20; yellowiſh ground tinged with red, ſmart acid flavour, makes very good cider.—Slatter's No. 21; tinged on the ſun-ſide with red and brown, very pleaſant flavour, and will undoubtedly be eſteemed as one of our beſt cider-apples.——The four laſt-named apples, the author ſays, are new, the trees being lately raiſed from kernels by Mr. Slatter of Ilminſter, Somerſet, whoſe orchards and cider have long acquired much celebrity.——Caſtle-pippin; greeniſh yellow, veined with brown and ſlightly tinged with red, mild acid, and makes good ſecond-rate pale cider.—Saw-pit; red throughout, acid flavour, and by ſome is eſteemed the beſt cider-apple in the country.—Pomme apis; large, yellow, faintly tinged with red on the ſun-ſide, broad at the ſtem, very juicy, ſmart but pleaſant acid, is undoubtedly a fine cider-fruit: it is, however, very little known in this country, having been brought from France but a few years ſince, and the propagation of it confined to one or two nurſeries only."

peculiar quality in the ſoil which produces them; but that a preference has been given to ſoils of oppoſite kinds by the planters of different ages. Thoſe of the laſt century uniformly contended in favour of a light ſandy loam, and on that their fineſt ciders were made: at preſent, a ſoil of a diametrically oppoſite quality, a ſtrong red clay is generally preferred. Much of the ſoil which is there called clay is properly argillaceous marl; and ſome of it contains a large portion of calcareous earth, and effervеſces ſtrongly with acids. He has found this ſoil to form the ſubſtratum of ſome orchards much celebrated for producing ciders of the firſt quality. It appears to have the effect of mitigating the harſhneſs of rough auſtere fruits; and that, as the trees grow with great luxuriance in it, it is, perhaps, of allſoils the beſt calculated to anſwer the wiſhes of the planter; but that the ſtrongeſt and moſt highly flavoured liquor which has hitherto been obtained from the apple is

In Devonſhire:—Staverton red-ſtreak; whitiſh-yellow at the ſtem, brown tinged with red towards the upper end, pungent acid, makes a ſmart but pale-coloured cider; the tree a remarkably plentiful bearer.—Sweet broady; large and handſome, colour brown and red, makes good cider, uſeful for mellowing that of the very acid fruits; the tree large and fine, and bears plentifully.—Lemon bitter-ſweet; yellow rind, hard and firm, a pleaſant bitter, and is by ſome eſteemed a fine cider-apple.—Joſey; a handſome yellow, ſubject to ſpots of brown on the rind, of a mild acid taſte, very ſoon after gathering perfects the ſaccharine fermentation, makes mild pleaſant cider but not laſting; it is alſo a good table fruit.—Orcheton pippin; a very handſome apple, yellow on one ſide and red on the other, of a highly pleaſant flavour, excellent for cider, the table, and the kitchen; in point of general utility perhaps few apples are ſuperior.—Wine-apple; greeniſh-yellow ground, very thickly ſtreaked with red all over, pulp a little red, mild acid, is a very good cider-fruit.—Marygold ſpice-apple; yellow ground, light brown about the ſtem, highly and beautifully tinged with pink, mild acid, of a ſpicy reliſh, makes excellent cider of a delicious flavour; it is a delicate fruit alſo for the table, and keeps long.—Ludbrook red-ſtreak; yellow ground finely tinged with pink, ſmart acid, and makes excellent cider: the tree ſubject to canker.—Green Corniſh; yellow with green ground lightly tinged with red, of a mild acid flavour, early ripe, and makes good cider.—Butter-box; yellowiſh-green tinged with light red, mild acid, makes pleaſant but not laſting cider.—Red Corniſh; red nearly all over, of a mild acid, makes good cider.—Broad-noſed pippin; large, rich yellow, mild acid, makes pleaſant but not ſtrong cider.—Cat's-head; large, greeniſh yellow, pleaſant acid, makes good cider.—Brandy apple; middling ſize, white, ſmart acid, makes pale-coloured friſky cider.—Pine's red-ſtreak; very handſome, red all over except at the ſtem, flavour not ſo ſmart as the Ludbrook, but a cider equally good.—Winter red; dark-red with ſome tinges of brown at the ſtem, criſp in its pulp, very juicy, of a ſmart ſpicy flavour; will keep until April, and is excellent both for cider and the table.—Sweet pomme-roi: yellowiſh-green on the ſhade-ſide, and brown tinged with red on the ſun-ſide, of a luſcious flavour; is deemed a good cider-apple.—Bickley red-ſtreak; a late fruit, greeniſh and yellow finely tinged with red, pulp firm, flavour ſomewhat acrid, is a moſt excellent cider-apple."

The ſorts of pears that are in moſt eſtimation are the Squaſh, the Oldfield, Borland, Red Pear and Sack.

produced by a ſoil which differs from any of thoſe that have been mentioned—the ſhallow loam on a lime-ſtone baſis*." There can be no doubt but that the apple-tree is capable of ſucceeding in ſoils of very different qualities, provided they be perfectly free from ſtagnant moiſture; but we havefound from many trials that in ſtiff retentive ſoils, where the bottom is wet, they begin to grow moſſy and decline in the courſe of a few years. It has been found that the early fruits obtain their greateſt perfection in a ſandy ſoil, and the late ones anſwer beſt when they are planted in a ſtrong loamy or clayey one: the more valuable fruits, as the ſtyre, hagloe crab, and golden pippin delight moſt in the light ſandy ſoils. And it is a fact fully determined, that cuttings from the ſame tree grafted upon ſimilar ſtocks, but planted in different ſoils, produce different liquors. It is alſo admitted that liquors of the ſtrongeſt body, and which keep beſt, are produced from trees grown in clayey ſoils†.

Pears are much leſs particular in reſpect to the nature of the ſoil on which they are planted than apples, as they are found to ſucceed and afford fruit in almoſt every ſort of land‡.

The nature of the ſituation and aſpect that is moſt favourable and proper for the apple is likewiſe equally involved in difficulty: ſome contending for high, others low ſituations, as well as for different aſpects. The intelligent writer juſt mentioned, however, obſerves, that "the apple-tree ſucceeds beſt in ſituations which are neither high nor remarkably low. In the former its bloſſoms are frequently injured by cold winds, and in the latter by ſpring-froſts, particularly when the trees are planted in the loweſt part of a confined valley. A ſouth or ſouth-eaſt aſpect is generally preferred, on account of the turbulence of the weſt, and the coldneſs of north winds; but orchards ſucceed well in all; and, where the violence of the weſt wind is broken by an intervening riſe of ground, a ſouth-weſt aſpect will be found equal to any§."

It has been ſuggeſted, that the more early ſorts of apples ſhould be planted in ſouthern aſpects, and thoſe of the later kinds in northern ones; as by theſe means the former may be rendered ſo forward and the latter ſo protracted as to be leſs in danger of injury. And where the land of a farm will permit, it is ſuppoſed that advantage may be derived from having this ſort of trees planted in different ſituations in reſpect to expoſure; as in

* Knight's Treatiſe on the Culture of the Apple and Pear.

† Herefordſhire Report, 4to. ‡ Ibid.

§ Knight on the Culture of the Apple and Pear.

this way the chance of eſcaping blights will be greater, as where one fails the other may ſucceed*.

In regard to the choice of fruits for every difference of ſituation, a writer of experience has remarked, that great attention "ſhould be paid to ſelect ſuch as are ſufficiently early to ripen well in it. A cider-apple may be ſafely pronounced to be too late for the ſituation it occupies, when it does not become yellow before the end of October; and he does not know any diſadvantages attending an early maturity, provided the kinds of fruit be capable of being kept a few weeks. An opinion prevails, that the liquors obtained from all early fruits are without ſtrength or body; but the ſtrongeſt cider yet known is produced by one of theſe—the ſtire. In cold and unfavourable ſituations, thoſe fruits will beſt repay the planter which, intheir general character, appear nearly related to the native kind, or crab; for, though the flavour of theſe be auſtere and ungrateful to the palate, the ciders produced from ſome of them, when they have been thoroughly ripened, are often found ſmooth and generous. But he would recommend the grafts to be taken from an improved crab, and not from a degenerated apple; for the former will poſſeſs much of the hardineſs and vigour, whilſt the latter will often inherit the debility and diſeaſes, of the parent tree†."

Different methods of planting are adopted in different diſtricts, but, according to Mr. Knight, the Herefordſhire planters generally perform the buſineſs in the "quincunx form, or in ſtraight lines croſſing each other at right angles. The former method is preferred in the hop-yard and paſture, and the latter in tillage, being leſs inconvenient to the ploughman. But it appears to him, that any given number of trees planted near each other in rows, with wide intervals, would be leſs injurious, either to paſture or tillage, than in either of the preceding methods. The trees in each row ſhould, in this caſe, be of the ſame variety of fruit, that no one, by poſſeſſing greater vigour and luxuriance, might overgrow and ſhade another, and that the whole row might appear a continuation of the ſame tree. The intervals between would afford conſiderable ſpace for the plough or paſture; and every tree, having room to extend its branches on each ſide, would be more protected than injured by its neighbours, and would attain nearly or quite as large a ſtature as if entirely inſulated. The cider-maker would alſo be enabled to collect with convenience each kind by itſelf, and might afterwards mix them according to his judgment or caprice. Unleſs an orchard be very large, not more than five or ſix kinds ſhould be planted in it; and if ſome of theſe be ſuch as

* Herefordſhire 4to Report. † Knight's Treatiſe on the Culture of the Apple and Pear.

bloſſom early, and others late, the planter will have as good a chance of an annual ſupply of fruit as a larger number of kinds would afford him."

It is conceived, by the ſame author, that "the diſtance between each row, as well as the ſpace between each tree, muſt depend on the ſituation and ſoil. When the former is high and expoſed, the trees ſhould be cloſely planted, to afford each other protection; and, when the latter is poor and ſhallow, their growth will of courſe be diminiſhed, and they will conſequently require leſs room: but in low and ſheltered ſituations, and deep rich ſoils, where the trees are little expoſed to winds, and attain a large ſize, wider intervals muſt be allowed them. In the former inſtances, a diſtance of twelve yards between each row, and half as much between each tree, will be ſufficient; in the latter, twenty-four yards between each row, and eight between each tree, will not be found too much, particularly if the ground is intended for tillage after the trees have grown to a conſiderable ſize. An opinion rather generally prevails at preſent in favour of planting ſingle trees, at twenty or twenty-five yards diſtance from each other, on arable grounds; and ſpecious reaſons may be offered in defence of this practice: the roots, as well as the branches, are at perfect liberty to extend themſelves in every direction; but the latter are every way expoſed to the ſtorms of autumn and to the cold winds of the ſpring; and trees of more hardy kinds than the apple are well known to grow much better when planted near enough to afford each other protection than when totally inſulated. It may be ſuppoſed, that trees growing in diſtant rows will not regularly occupy the whole ſurface of the ground with their roots; but theſe always extend far beyond the branches, and will meet acroſs very wide intervals. The growth of every inſulated tree is more low and ſpreading, and conſequently more injurious to corn or herbage growing under it. Where the mode of cultivation will admit, the rows ſhould always extend from north to ſouth, as in this direction each part of every tree will receive the moſt equal portions of light and heat*."

But the diſtance of the trees when planted in the field is frequently made much greater than the above, as from twenty-two to twenty-four or five; and ſome adviſe the diſtance of ſixty feet every way as the moſt proper and advantageous†. It is probable, however, that in planting at great diſtances there may be inconvenience in reſpect to the produce, from the trees being more expoſed to the cutting winds and froſts.

It is found that "apple-trees are generally the moſt productive of fruit when they are ſituated near the fold-yard, and the ground in conſequence much trodden and

* Knight on the Apple and Pear. † Herefordſhire and Somerſetſhire Reports.

manured by the cattle in the winter. The ground in which old apple-trees have grown is eſteemed very unfavourable to young ones. When, from contiguity to the houſe, an orchard is planted in this kind of ground, the pear and apple ſhould be made to ſucceed each other, as has been judiciouſly recommended by Mr. Marſhall*."

Experience has ſufficiently ſhown that trees of this ſort are commonly "raiſed with moſt ſucceſs, and at leaſt expenſe, in an old hop-plantation; the ground under this culture being always well tilled and manured, as well as fenced againſt all kinds of cattle. Conſiderable advantages may be obtained by planting twice the number which are to remain of trees in each row, uſing two kinds of fruit, and putting each alternately. The kind which ſucceeds beſt may be left, and the other be removed to the tillage. Trees of a large ſize may be tranſplanted without the leaſt danger in the autumn, particularly if the roots be ſhortened in the preceding winter. The ſubſoil of the ground which ſuits the hop is not unfrequently too moiſt for the apple, a defect rarely removed by draining. But where a hop-ground is wanting, trees may be raiſed in tillage or paſture; but the expenſe of defending them properly will be conſiderable, particularly in the latter, in which, though ever ſo well defended, they uſually make but a ſlow progreſs. In tillage-land, the leaſt expenſive (and perhaps the beſt) method of raiſing apple-trees will be to exclude every ſpecies of cattle except ſheep and pigs, and to defend the trees only with ſmall branches bound round their ſtems, as in the broom or beſom of the farm-houſe. This fence muſt begin cloſe to the ground, and riſe to a greater height than the ſheep or pigs, or the chains of the horſes in ploughing, can reach; and to preſerve the bottoms of the ſtems from injury by the plough, a ſtrong oak ſtake ſhould be driven into the ground on each ſide of every tree. The ſmall branches which defend the ſtems will require to be replaced every other year; but this will be done at a very trifling expenſe†." In the paſture-method of planting the formality of the row may be diſpenſed with; but the trees will ſucceed much better if three or five be planted near each other with wide intervals, than if each ſtand entirely alone‡.

In regard to the method of removing and planting the crab-ſtocks or apple-trees,

* Knight on the Culture of the Apple and Pear. † Ibid.

‡ Mr. Knight obſerves that, in making a plantation in paſture ground, timber-frames will be neceſſary. The kind now moſt in uſe are made with two flat poſts, placed with their wide ſurfaces parallel to each other, at two feet apart, having boards nailed to their edges on each ſide, with ſmall diſtances between them. The trees in this way are perfectly protected from cattle; but when their branches extend themſelves, and become agitated with the wind, the ſtems can ſcarcely eſcape being rubbed againſt the frames. A much better kind of frame is made with three poſts, placed triangularly round the tree, approaching each other at the roots and diverging conſiderably upwards. This appears more expenſive than the other; but timber of much inferior value may be uſed."

the latter of which is moſtly uſed in the field at the time when they firſt begin to bear fruit, in the former caſe the ſtocks are grafted*. It is frequently the caſe that too little attention is beſtowed to "leave the roots as long, and as little injured, as poſſible, and not to plant them deeper than they formerly grew. The ſoil round each tree ſhould be dug eighteen inches deep, and four or five feet wide, placing the ſod, if the ground be paſture, in the bottom of the holes, as recommended by Mr. Marſhall. If the holes in this caſe be made ſix months before the time of planting, and if a ſmall quantity of rich mould be mixed with that of the field, immediately round the roots, it will much accelerate the future growth of the trees; but it will rarely be adviſable to make uſe of any very delicate or highly cultivated fruits when this method of planting is adopted. The branches of the trees, whether grafted or not, and wherever planted, ſhould be much retrenched; and the mould may be raiſed a few inches round the ſtems, to prevent their being ſhaken by the wind. A ſtake to each will alſo be of much ſervice; but great care muſt be taken to prevent the bark of the tree receiving injury by being rubbed †."

There is another circumſtance, eſpecially where the land is ſomewhat inclining to moiſture, that demands attention, which is that of not planting too deep. If ſo planted as to be capable of reſiſting the wind, they cannot be placed too near the ſurface ‡. Much miſchief is frequently done by deep planting, as the apple-tree is particularly liable to be deſtroyed by the ſtagnation of water about its roots.

In making a plantation, the autumn is the moſt eligible ſeaſon; but if, from any cauſe, the planting be delayed till ſpring, the trees will ſucceed perfectly well, if the ſoil or ſucceeding ſeaſon be not remarkably dry. When the trees have once taken root in the hop-plantation or tillage, they will not require any thing more than pro-

* Mr. Billingſley gives the following directions for planting and grafting this ſort of fruit, "As ſoon as the ground for the orchard is ready, plant your trees (ſtocks) and be particularly careful not to plant them deep in the ground. After about four years, lop their heads, and graft them with the fruit you moſt eſteem, taking care to adapt your grafts to the ſtock. In other words, let your grafts, and the trees on whoſe heads you graft, be as ſimilar in reſpect to luxuriancy as you can; on this a great deal depends. It is found, that a luxuriant groſs-growing graft will never ſucceed on a ſlow-growing ſtock, and *vice verſa*. It may alſo be obſerved, that ſome excellent ſorts of fruit are naturally ſo ſlow of growth, that a man, inſtead of planting for himſelf, plants for his grandchildren; and if you endeavour to force them (which is often injudiciouſly done) with luxuriant ſtocks, you occaſion diſeaſe. The tree never becomes large or laſting, and the fruit will be taſteleſs and inſipid."

The ſtocks, whether apple or crab, are raiſed by ſowing the ſeed in drills in a good piece of ground, and keeping the plants clean. Some prefer the apple, others the crab ſtock; the former comes into bearing ſooner, but is more liable to the diſeaſes of the moſs and canker, and much leſs durable. The grafts may be beſt taken from neither too old or too young trees, but ſuch as are healthy.

† Knight on the Apple and Pear. ‡ Herefordſhire 4to Report.

tection from the planter; but in the paſture, the ground ſhould be annually dug three or four feet wide round each, during the firſt four or five years after they are put in.

Apple-trees being naturally very full of branches, frequently require the operation of pruning; and, when properly executed, great advantages will be found to ariſe from it: but, as generally performed, the injury the trees ſuſtain is much greater than the benefit they receive. It has been obſerved that, "the ignorant pruner gets into the middle of the tree, and lays about him to right and left, till he leaves only ſmall tufts of branches at the extremities of the large boughs. Theſe branches, now receiving the whole nouriſhment of the tree, of courſe increaſe rapidly, and ſoon become, when loaded with fruit or ſnow, too heavy for the long naked boughs, which are of neceſſity full of dead knots from the former labours of the pruner, to ſupport. Many hundred trees annually periſh from this cauſe. It is believed, the preſent ſyſtem of pruning ought to be preciſely reverſed, and that the pruner ſhould confine himſelf almoſt entirely to the extremities of the bearing branches, which are always too full of wood, and leave the internal part of the tree nearly as he finds it. Large branches ſhould rarely, or never, be amputated*."

The principal reaſons of trees of this ſort not producing fruit as regularly as crops in any other caſes, are the effects of froſt in the ſpring months, as in April, and thoſe of blights in the following. The former is found to be moſt dangerous when it comes on ſuddenly, while the *blow* is moiſt. It has been remarked by the author of the Philoſophy of Agriculture and Gardening, "that the early bloſſoms of apple and many other trees are frequently deſtroyed by an exceſs of cold: and Mr. Knight aſſerts, that the hazineſs of the air which uſually accompanies warm days and froſty nights, with a north-eaſt wind, in the ſpring, is injurious to the bloſſom of every tree, and particularly ſo to that of the apple; for the warmth of the day hatches the eggs of the inſect which breeds in it, whilſt the coldneſs of the night, by checking the progreſs of the ſap, retains the bloſſom in its half expanded ſtate to form a nidus for it. This inſect, which aſſumes the winged ſtate in July, is a ſmall brown beetle, and that it then proably lays thoſe eggs on the trees, which, if the ſucceeding ſeaſon be unfavourable, prove deſtructive of the future crop of fruit†." And it is further obſerved that, "the leaves and bloſſoms of the apple-tree are ſometimes entirely deſtroyed by a numerous tribe of caterpillars, ſome kinds of which become moths in the ſummer and autumn, and others in the ſucceeding ſpring, as well as by a minute inſect of the cochineal tribe". The ſame writer adds that "the bloſſoms of the apple appear to fail not unfrequently from want of impregnation, when the weather is unuſually hot and dry, or when cold winds prevail;

* Knight on the Apple and Pear. † Ibid.

as he has often obſerved the *farina* to wither and die on the *antheræ* in ſuch ſeaſons. In each of theſe caſes he has always ſeen thoſe trees moſt productive, which, having had the good fortune to eſcape the deſolating hand of the pruner, were moderately full of wood, and capable of affording their bloſſoms ſome protection from froſt and cold winds, or exeſſive heat."

After the apples have remained upon the trees till they are become in a proper ſtate of ripeneſs, they are then to be carefully gathered, and properly ſeparated, as the goodneſs of the liquor in ſome meaſure depends upon this being properly performed. It has been adviſed that "thoſe whoſe rind and pulp are tinged with green or red without any mixture of yellow," as that colour diſappears in the firſt ſtages of fermentation, ſhould be kept perfectly ſeparate from ſuch as are yellow or yellow blended with red. The latter ſort after being left on the trees till ſufficiently ripe to fall without much ſhaking, "are alone capable of making fine cider†." When thus ſeparated, they ſhould be kept till quite mellow, which is beſt done by expoſing them in a thin layer to the influence of the ſun and air in ſome covenient covered ſituation, as by that means the liquor will be ſtronger and the danger of an unpleaſant flavour be avoided. No preciſe rules have been laid down for aſcertaining the moſt advantageous degree of maturity to which they ſhould be brought for this purpoſe, but it is ſuggeſted that as long as they become more yellow without rotting, they may improve. In this ſtate they are fit for being converted into cider by the proper proceſs †.

* Knight on the Apple and Pear.

† This is a proceſs that is much too extenſive, and which does not properly belong to a work of this kind; but the following practical directions, given by the author of the Somerſetſhire Corrected Agricultural Report, may probably be uſeful:—

"The fruit being properly matured, every neceſſary utenſil ought to be ſet in order for cider-making; the mill, preſs, tubs, caſks, and pails, clean waſhed, and ſuffered to dry before they are uſed.

"Several methods are practiſed for converting apples into *pommage*; but the two moſt chiefly in uſe are the bruiſing-ſtone with a circular trough, and the apple-mill. The beſt internal conſtruction of a mill ſeems to be that which has two pair of rollers, the upper pair being ſtuck with *coggs* and *dags*, and the under pair, being of very hard wood, turned ſmooth, and worked with coggs only. The upper rollers grinding the apples to a coarſe pommage, and the under ones ſqueezing it to a very fine pulp.

"The apples being, by either of the for going methods, properly bruiſed, the pommage is carried to the preſs, and a ſquare cheeſe made thereof, by placing very clean ſweet ſtraw or reed between the various layers of pommage, or elſe by putting the ſame into hair cloths and placing them one on another. It is of importance that the ſtraw or reed be ſweet and perfectly free from any muſtineſs, leſt the cider be impregnated therewith.—Particular care ought alſo to be taken to keep the hair cloths ſweet by frequent waſhing and drying, elſe the ill effects of their acidity will be communicated to the cider. To this cheeſe, after ſtanding a while, a ſlight preſſure is at firſt given which is gradually increaſed until all the juice or *muſt* be expreſſed; after which this *muſt* is ſtrained through a ſieve and put into veſſels.

There is little difference neceſſary in the method of planting pears from that which has been laid down for apples; except in their being beſt raiſed on their own ſort of

Here the great art of making good cider commences. "It is well known that there are various ſtages of fermentation in this juice, each of which changes the very quality and nature of the fluid; but the principal which are to be particularly attended to here are three; namely, the vinous the acetous, and the putrefactive. The firſt converts the *muſt* from its turbid fulſome ſtate, to a tranſparent ſpirituous liquor. If the juice be expreſſed from ſour apples, this fermentation is perfected in two or three days; but if from ſweet apples, not under a week or ten days.

"The next ſtage of fermentation gives an acidity to the vinous liquor before ſpoken of, converting it to vinegar. This fermentation begins ſoon (frequently in a few hours) after the vinous is ended; and, if the fermentation be improperly haſtened by heat, *before* the vinous is perfected. The third (and all ſucceeding fermentations) diſengages an alkali from the liquor, and gives it a tendency to putrefaction.

"To regulate the firſt, and to check the others, is then the great buſineſs of the cider-maker. It is well known that fermentation ſhould not by too much heat be carried on rapidly, nor by extreme cold too ſlowly; as in each caſe the fermenting body will be injured. Hence it appears that a certain degree of warmth, or rather imperceptible heat, conduces beſt to regulate this operation. This degree of warmth may be underſtood to reſt between thirty-eight and forty-ſix degrees of Fahrenheit's thermometer. If then the warmth of the cellar in which new-made cider is placed be between theſe points, we may expect (no adventitious cauſe interrupting) that the vinous fermentation will commence and go on with due regularity.

Fermentation is an inteſtine motion of the parts of a fermentable body; this motion, in the preſent caſe, is always accompanied with a ſmall hiſſing noiſe and evident ebullition, the bubbles riſing to the ſurface, and there forming a ſcum or ſoft ſpungy cruſt over the whole liquor. This cruſt is frequently raiſed and broken by the air as it diſengages itſelf from the liquor and forces its way through it. Theſe effects continue while the fermentation is briſk, and at laſt gradually ceaſe. The liquor now appears clear to the eye, and has a pungent vinous ſharpneſs upon the tongue. This is the critical moment which the cider-maker ought not to loſe ſight of; for if he would have a ſtrong and generous liquor, all further ſenſible fermentation muſt be ſtopt. This is beſt done by racking off the pure part into open veſſels, and placing them in a more cool ſituation for a day or two: after which it may again be barrelled and placed in ſome cool place for the winter. It is poſſible, however, that a variety of avocations at the ſeaſon of cider-making may take off the farmer's attention, and give opportunity to the acetous fermentation to come on ere he is aware of it.

"The moſt popular remedies in this caſe are the following:—a bottle of French brandy, half a gallon of ſpirit extracted from the lees of cider, or a pailful of old cider poured into the caſk, ſoon after the acetous fermentation is begun: but it is not to be wondered at if all theſe ſhould fail if the cider be ſtill continued in a cloſe warm cellar. To give effect to either, it is neceſſary that the liquor be as much expoſed to a colder atmoſphere as conveniently may be, and that for a conſiderable length of time. By ſuch means it is poſſible to repreſs the ſecond fermentation in a great meaſure; and if a caſk of *good* cider cannot from thence be obtained, a *tolerable* one may.

The *Stumming* of cider is a provincial phraſe, ſignifying the fuming a caſk with burning ſulphur; and is thus performed:—Take a ſtrip of canvas cloth about twelve inches long and two broad, let it be dipped in melted brimſtone. When this match is dry, let it be lighted and ſuſpended from the bung of a caſk (in

ſtocks, their requiring wider intervals from their taller growth, and being planted, whether in the orchard or in the tillage-land, at much greater diſtances; in the former at not leſs than eighteen yards diſtance in the rows, and eight or nine from tree to tree, and in the latter not leſs than twenty-five or thirty between the rows. The form and ſtature of the different varieties muſt alſo be regarded, and only one ſort be planted in a row. And as in ſome ſorts the fruit is only produced on the outſides of the branches expoſed to the ſun and air, while in others it is in every part of the tree, it is recommended that the former ſort ſhould be planted at greater diſtances than the latter kind. From the irregularity of the ripening of the fruit, a great number of trees of the ſame ſort is neceſſary to afford a ſufficiency for being ground at a time *.

It has been found by the ſame writer that the produce of an acre of land planted with apple-trees is nearly a third leſs than the ſame extent planted with pear-trees;

which there are a few gallons of cider) until it is burnt out: the caſk muſt remain ſtopped for an hour or more, and then be rolled to and fro, to incorporate the fumes of the match with the cider, after which it may be filled. If the ſtumming be deſigned only to ſuppreſs ſome ſlight improper fermentation, the brimſtone match is ſufficient: but if it be required to give any additional flavour to the cider, ſome powdered ginger, cloves, or cinnamon, &c. may be ſtrewed on the match when it is made: the burning theſe ingredients with the ſulphur will convey ſomewhat of their fragrance to the whole caſk of cider; but to do it to the beſt advantage, it muſt be performed before the vinous fermentation be fully perfected.

To perfect a veſſel of cider, after the foregoing ſteps have been taken, it will be found neceſſary now and then to ſupply the waſte occaſioned by evaporation and inſenſible fermentation with freſh cider; and about the the beginning of April following to give it a final racking. At this time a commixture of cider made from Jerſey or any other luſcious and ſweet apple, with that of the ſour apples, may be recommended, to give it a general regular colouring.—Should, however, a higher colouring be required than what reſults from ſuch commixture, a ſmall quantity of burnt or melted ſugar, prepared in the following manner, will produce the deſired effect:—Take a pound of ſugar, and put it into a ſtew pan with a little water, and place it over a clear fire, ſtirring it frequently till it turns black; take it off the fire, and as it cools apply ſome cider thereto, by little and little, and continue ſtirring it till it be thoroughly mixed. This colouring tinges to perfection; it is very cheap, gives no luſcious ſweetneſs, but rather an agreeable bitterneſs, and thus recommends itſelf to the nicer palates. Soon after this, in the ſame month, the cider may be bottled; and by the month of June the owner may expect to find himſelf poſſeſſed of a rich, pleaſant, and wholeſome liquor.

More full directions for the conducting of this proceſs are given in Mr. Knight's valuable Treatiſe on the Culture of the Apple and Pear; and the principles on which it proceeds chemically explained. And alſo in Mr. Crocker's Eſſay on the ſame ſubject.

The ſame rules in a great meaſure hold good in the proceſs of making the perry, except in its requiring more art in the fining of the liquor and a more equal ſituation in reſpect to temperature.

* Knight on the Culture of the Apple and Pear.

but then the apple-tree begins to bear much earlier, and cider is juſtly a preferable liquor to that of perry.

In reſpect to the loſs in the paſture where the land is cloſely planted with apple-trees, though it may be conſiderable, it will ſeldom be more than one-tenth of the value of the fruit. Beſides, the graſs produced in theſe ſituations is highly valuable from its coming early in the ſpring when much wanted; and if kept cloſely fed down, and prevented from becoming coarſe, will ſupport much ſtock*.

In ſhort, it is remarked by Mr. Knight, "that ſuch lands as produce but a ſcanty herbage may frequently be converted into excellent orchard ground. As an inſtance of the advantage in this way, an orchard of this ſort, which for the laſt thirty years has afforded a produce not much leſs than four hundred gallons the acre, would not, it is ſuppoſed, if the trees were wholly removed, ſupport two ſmall ſheep during the year with facility. The ſoil is of the indurated, deep, ſtiff, clayey kind, which, it is conceived, would be leſs worth twelve ſhillings an acre as a paſture, than it is worth three pounds an acre as an orchard."

It is added, "that there are in this iſland many hundred thouſand acres equally capable of being improved to the ſame extent by planting with apple and pear-trees, which might be effected at a very ſmall expenſe, from the trifling value of the plants†."

The ſame writer has likewiſe ſuggeſted, that by diſtributing a few trees of the apple and pear kind thinly over the meadow and paſture lands in all thoſe diſtricts where they could be planted with ſucceſs, but little injury would be done to the herbage; while a ſound palatable liquor would be provided for the whole of the population employed in the buſineſs of huſbandry, and in productive ſeaſons a ſupply afforded for other purpoſes; beſides advantages derived in the ſaving of barley, as well as the prevention of ſo many acres being cultivated under the hop-ſyſtem ‡.

Timber-Trees.—In the raiſing of timber or other foreſt-trees, almoſt every thing depends upon properly adapting them to the particular nature of the land, its being in a ſuitable ſtate of preparation for their reception, and the planting being performed at a proper ſeaſon in a perfect manner and at proper diſtances, according to the nature of the trees and ſituation. There are likewiſe a few other circumſtances that demand attention in conducting this buſineſs in the moſt effectual manner, which are thoſe of keeping the trees perfectly clean and free from all ſorts of rubbiſh, and the ſhade or annoyance of other ſorts of plants, eſpecially during their early growth, and at the

* Knight on the Apple and Pear. † Ibid. ‡ Ibid.

ſame time having them well ſheltered and ſecured from the intruſion of all ſorts of live ſtock. It is only by attention in theſe different reſpects that plantations of any kind of trees can be raiſed with any degree of certainty or ſucceſs.

The particular kinds of ſoil beſt adapted to the cultivation of the different ſorts of timber trees, and in which ſome or other of them will be found to grow in the moſt perfect manner, are gravelly or light ſandy ſoils, with free porous ſubſoils; gravelly or ſandy loams on porous ſubſoils; loamy, ſandy, or gravelly ſoils on retentive ſubſoils; gravelly chalk or chalky loams on porous ſubſoils; loamy clays or clayey loams on porous ſubſoils; and ſtrong clayey or loamy ſoils on retentive ſubſoils. Likewiſe thin mooriſh heathy ſoils on gravelly or porous ſubſoils, alſo on clay or retentive ſubſoils. Such ſoils as are of a ferruginous kind, and of little depth, are found the moſt unfavourable to the growth of timber, eſpecially where the ſubſoil is retentive, as the deſtructive moiſture in ſuch caſes ſtagnates near the ſurface, and deprives the roots of thoſe healthy materials which they ſhould take up for the purpoſe of nouriſhment and ſupport.

In forming plantations, beſides the neceſſity of having them properly ſecured by good fences, if the ſoils be not ſufficiently dry, recourſe muſt likewiſe be had to draining to take off the ſuperfluous water: the ſituation and ſoil being thus attentively conſidered and prepared, a proper ſelection of plants ſhould be made. Such as moſt particularly deſerve attention for waſte lands, are oak, aſh, elm, beech, birch, ſycamore, larch, and the various kinds of fir. The oak has been found to thrive on ſoils of very oppoſite qualities, but thoſe of a dry, deep, firm nature are beſt adapted to it, with a proper degree of ſhelter. The aſh proſpers in almoſt every dry ſoil, even in expoſed ſituations; in rather damp and free mellow ſoils the elm is to be preferred, eſpecially for waſte lands; if in very elevated places a chalky, gravelly, or light loamy ſoil abound, the beech may be planted with ſucceſs. In all ſoils and ſituations the larch is found to thrive where the Scotch fir cannot be raiſed, and the latter is proverbially known to ſucceed in the pooreſt and moſt elevated places*.

* Nicol on Planting.

In the table below a view is given of the nature of the ſoil in which different ſorts of timber-trees are found to ſucceed in the moſt certain manner, with the uſes to which they may be converted*.

* *Surface Soil.*	*Subſoil.*	*Common Growth.*	*Planted Growth.*	*Uſes of.*
Heavy and gravelly Loams.	Heavy Loam with Chalk.	Birch, Hornbeam, Oak, Aſh, Hazel, Beech, &c.	Oak, Aſh, Cheſnut, Willow, Lime, Walnut.	Timber, Hop Poles, Cord Wood, Hurdles, Bavins for Bakers, and Lime.
Sandy Loams.	Heavy Loam.	Ditto.	Elm, Beech, Weymouth Pine, common Spruce.	Ditto.
Flinty ſtrong Loam.	Heavy Loam.	Ditto.	Willow and Cheſnut.	Timber, Fencing, Poles, and as above.
Gravelly and ſandy Loams.	Gravelly Loam.	Aſh, Beech, Oak, Hazel, &c.	Cheſnut, Aſh.	Hop Poles, Fencing Poles, and all as above.
Gravelly ſandy and flinty Loams.	Heavy gravelly flinty Loam.	Aſh, Beech, Hornbeam, and Oak.	Aſh, Beech, Larch, &c.	Timber, Fencing, Hop Poles, Cord Wood, for Charcoal, Bavins, &c.
Flinty dry poor gravelly Loams.	Chalk at 2 feet depth with gravelly Loam	Beech, Oak, &c.	Beech, Larch, &c.	Cord Wood, Bavins, and Hop Poles.
Flinty and gravelly Loams.	Chalk 4 ft. with deep gravelly Loam.	Aſh, Oak, Hazel, &c.	Aſh, Larch, &c.	Cord Wood, Hop Poles, Bavins, Stakes, Ethers, &c.
Ditto.	With a few Flints, but nearly as above.	Oak, Hazel, Beech, and Aſh.	Cheſnut, Aſh, and Willow.	Hop Poles, Fencing, Poles, Stakes, Cord Wood, &c.
Lightiſh black Loam.	Dry ſandy Gravel.	Birch, Elm, Aſh.	Aſh, Elm, &c.	Various Uſes in Huſbandry.
Flinty gravelly Loams	Strong Loam with Flints.	Oak, Aſh, Beech, &c.	Aſh, &c.	Poles, Bavins, Cord Wood, &c.
Chalky flinty gravelly Loam.	Chalk with ſome gravelly Loam.	Ditto.	Ditto.	Ditto.
Gravelly Loam.	Heavy flinty and poor Loam.	Oak, Aſh, Hazel, and Beech.	Aſh, Oak, &c.	Common Produce a few Poles, Cord Wood, Bavins, &c. Plantation many Poles, and the above.
Gravelly and chalky Loams.	Gravelly Loam with Chalk.	Oak, Aſh, &c.	Aſh and Cheſnut.	Poles, Cord Wood, &c.
Gravelly Loam.	Ditto.	Aſh, Oak, and Beech.	Oak, Larch.	Ditto.
Ditto.	Gravelly Loam and heavy Loam.	Ditto.	Scotch Pine.	The ſame.
Sandy Gravel.	Gravelly and Sandy Loam.	Ditto, Scotch Pine.	Larch, Cheſnut, &c.	Poles, Stakes, Ethers, &c. &c.
Stone Shatter and gravelly Loam.	Strong Loam with Ragſtone.	Oak, Hazel, Birch, &c.	Birch, Oak, &c.	Oaken Tillers, ſmall Timber Poles, &c.
Stone Shatter and gravelly Loam.	Gravelly Loam with ſome Stone.	Oak, Birch, Aſpen, Hazel, and Aſh.	Aſh, Cheſnut, and Willow.	Fencing Poles, Hop Poles, Cord Wood, &c.
Gravelly Loam.	Gravelly Loam with ſome Stones.	Oak.	Cheſnuts.	Hop Poles, Fence Poles, &c.
Sandy Loam.	Gravelly Loam.	Birch, Oak, Hornbeam, &c.	Cheſnut, &c.	Fence Poles, Hop Poles, &c.
Sandy Loam and Stone Shatter.	Gravelly Loam with Ragſtone.	Oak, Beech, Birch, Hazel, Aſh.	Ditto.	Ditto.
Gravelly Loam and Stone Shatter.	Deep Loam, heavy Clay, and Gravel.	Ditto.	Ditto.	Ditto.
Ditto.	Gravelly Loam.	Ditto.	Ditto.	Ditto.
Gravelly and ſandy Loam.	With ſtrong Clay and Loam.	Oak and ditto.	Aſh, Larch, &c.	Poles, Fire Wood, &c. as above.
Gravelly Loam flinty.	Gravel with Clay, and ſome Flint	Scrubby Oak, Hazel, &c.	Oak, Aſh.	Timber and ditto.
Wet ſpungy Land.	Moiſt and boggy Earth.	Alder, Willow.	Alder, Ozier, Willow. &c.	Hurdles, Hop Poles, &c.
Drier ditto.	Ditto more dry.	Poplar.	White Poplar, Willow-	Hop Poles, &c.
Light ſandy Loam.	Dry gravelly Earth.	Mountain Aſh, Aſh.	Scotch Pine, Silver Fir.	Hop Poles.
Light gravelly Loam.	With dry Gravel.	Aſh.	Sycamore,	Timber-Turnery, &c.

In planting, where it is performed on the more elevated or mountainous tracts, warmth and ſhelter are to be conſidered, as without theſe the trees ſeldom thrive in a perfect manner. In ſuch ſituations there is, in general, the moſt difficulty and the leaſt progreſs made in the raiſing of timber-trees; the ſucceſs of the planter depending greatly upon fixing on ſuch ſorts of timber-trees as may in future become the moſt highly valuable, on planting thickly with plants of not too large a ſize, and on a conſiderable plat or extent of ground both in length and width being planted*.

In theſe unfriendly ſituations to the growth of trees, ſmall plants muſt conſequently be choſen and planted thick on the ground; as the winds are very prejudicial to trees of a large ſtature, by looſening the roots and frequently breaking the fibres: but though this is the moſt diſadvantageous ſituation for planting, it is poſſible, with proper care in the above reſpects, to rear young timber in it. Where it is intended to cover a mountain from its baſe, it will be moſt conveniently done by planting round the baſe in the firſt inſtance, riſing gradually; by which means an artificial ſhelter will be forming, from the progreſs that will be made by the trees that were firſt planted, eſpecially if the extent is ſuch as to require ſeveral ſeaſons to complete the planting. The portion firſt planted ſhould be pretty extenſive, in all ſuch caſes eſpecially where ſhelter is principally intended.

The kinds of trees to be choſen for ſuch ſituations muſt be regulated, in a great meaſure, by the ſoil. The pine would perhaps be found to flouriſh moſt, but the larch is preferable as a nurſe. The mountain-aſh, the beech, the aſh, the ſycamore, the birch, the fir, &c. may all be planted with reaſonable hope of ſucceſs; and where the ſoil is deepeſt and richeſt, the oak†.

In low ſheltered ſituations, where the inconvenience of expoſure to the winds is obviated, timber-trees may be planted with greater certainty of ſucceſs; the chief care neceſſary in this caſe being to fix on trees of a proper kind, and placing them at proper diſtances, according to their ſorts and ſizes. As theſe ſituations admit of moſt kinds, on the more ſheltered parts, the oak, larch, elm, beech, horſe-cheſnut, walnut, lime, ſpruce and ſilver fir may be ſuitable; and on the leſs ſheltered portions, the aſh, birch, ſycamore, hornbeam, mountain-aſh, and fir, with a mixture of larch.

The banks of rivers and canals are moſtly favourable for the planter's purpoſe, and moſt ſorts of timber and other woods may be raiſed in ſuch ſituations; the oak, elm, poplar, willow, and ozier, according as they are more or leſs dry; but the preference muſt depend on the local circumſtances of the different caſes.

* Nicol on Planting. † Ibid.

Situations near the ſea-coaſt, or what are called maritime ſituations, are in general inimical to the growth of timber; but where ſuch are attempted to be planted, the beech and ſycamore will be found to bear the ſea breeze better than moſt others, and conſequently become deſirable as nurſes for the other trees. In theſe ſituations, where the bank riſes high, the beſt mode may be to plant in the face of it, conſiderably within the level of the top, in order to afford a ſcreen for the trees within till they riſe to a ſufficient height: and where it is flat, to adopt the method of planting in belts, beginning as cloſe as poſſible to the edge of the water, and planting the firſt rows very cloſe, as about thirty inches diſtance, employing ſtout well-rooted plants of not more than twelve or eighteen inches growth*.

There are two different methods principally purſued by planters in providing the trees: one is by raiſing the plants, in a detached piece of ground, as a nurſery, from the ſeed; the other by purchaſing the trees from the nurſeries in the neighbourhood in the ſtates proper for being planted out. The former is probably the beſt and moſt œconomical plan, where the buſineſs of planting is to be conducted upon an extenſive ſcale, as it is moſtly troubleſome and often impoſſible to procure the quantity or ſorts of plants that are wanted at the proper ſeaſon. Beſides, the plants in general ſucceed better when they are put in as faſt as they are removed. But for ſmall concerns it is in moſt caſes more advantageous and convenient to obtain them from a nurſery, as they can never be raiſed upon a ſmall ſcale ſo cheaply as they may be provided in this way. Wherever nurſeries are attempted, the nature of the land ſhould be tolerably good, as it is almoſt impoſſible to raiſe good plants on very poor ſoils. Different ſorts of land have been recommended for this purpoſe: but it is evident that no one kind can be fitted to the growth of every ſort of tree; yet ſuch as are dry and friable, without being too light, are capable of raiſing healthy trees of moſt kinds. A late writer† has recommended for this purpoſe "a loam of a middling texture, rather inclining to ſand, neither rich nor poor, from eighteen to twenty-four inches in depth; lying on a free, porous ſubſtratum. This will be found more generally congenial to the nature of the different foreſt trees than any other ſoil. But there is no general rule without exception. If there be a diverſity of ſoils, and if they do not too nearly approach the extremes of meagre ſterility and exceſſive fertility, ſo much the better, ſince all the kinds do not exactly thrive alike in the ſame ſoil; and an opportunity would thereby be afforded of placing each in that more congenial to its nature. The ſite ſhould neither be high nor low, ſheltered nor expoſed, in any extreme, for the ſame

* Nicol on Planting. † Ibid.

reaſon, viz. that it may the more generally anſwer all purpoſes. For a nurſery of this deſcription, nothing can be more eligible than the ſpot which may occaſionally be occupied as a kitchen-garden. The pulverization and mellowneſs afforded by the previous growth of various culinary crops, bring the land into the moſt ſuitable ſtate for the raiſing of young trees, and at the ſame time clear it the moſt effectually from vermin, as the grub, and other inſects*."

The ground ſhould conſtantly be well dug or trenched over to its full depth; and, when neceſſary, well dreſſed with compoſts of lime, marl, dung, and other

* For the extenſive plantations of the Duke of Portland, in Nottinghamſhire, where the ſoil is of a light ſandy kind, "ſome well ſituated valley is choſen, as near the centre of the intended plantations as poſſible, for the purpoſe of a nurſery. If this valley is ſurrounded with hills on all ſides but the ſouth, ſo much the better. A piece of ground, conſiſting of as many acres as is convenient for the purpoſe, is fenced about in ſuch a manner as to keep out all noxious animals. At each end of the nurſery, large boarded gates are fixed, and alſo a road made down the middle wide enough to admit carriages to go through, which is found exceedingly convenient in removing the young trees from thence to the plantations. After the fence is completed, the ground on each ſide the road is trenched about twenty inches deep, which may be done for about 3l. 10s. or 4l. per acre, according as the land is more or leſs gravelly. It is beſt done in the ſpring, when the planting ſeaſon is over. If after the trenching, two or three chaldron of lime be laid on an acre, the land will produce an excellent crop either of cabbages or turnips, which being eaten off by ſheep in the autumn, will make the land in fine order for all ſorts of tree-ſeeds: but as the oak is the ſort of tree cultivated in general; this is the method purſued in raiſing and managing that moſt valuable ſpecies:—"In the autumn, after the cabbage or turnips are eaten off, the ground requires nothing more than common digging. As ſoon as the acorns fall, after being provided with a good quantity, ſow them in the following manner:—Draw drills with a hoe in the ſame manner as is practiſed for peaſe, and ſow the acorns therein ſo thick as nearly to touch each other, and leave the ſpace of one foot between row and row, and between every fifth row the ſpace of two feet for the alleys. While the acorns are in the ground, great care muſt be taken to keep them from vermin, which would very often make great havock amongſt the beds if not timely prevented. Let this caution ſerve for moſt other ſorts of tree-ſeeds."

After the acorns are come up, the beds require only to be kept clean from weeds till they want thinning; and as the plants frequently grow more in one wet ſeaſon where the ſoil is tolerably good, than in two dry ones where the ſoil is indifferent, the time for doing this is beſt aſcertained by obſerving when the tops of the rows meet; which is done, when that is the caſe, by taking away one row on each ſide the middlemoſt, which leaves the remaining three rows the ſame diſtance apart as the breadth of the alleys. In taking up theſe rows, the workman ought to be careful neither to injure the plants removed nor thoſe left on each ſide. The reſt of the young oaks being now left in rows at two feet apart, let them again ſtand till the tops meet; then take up every other row, and leave the reſt in rows four feet aſunder, till they arrive to the height of about five feet; which is full as large a ſize as is ever wiſhed to be planted. In taking up the two laſt ſizes, the method is to dig a trench at the end of each row, full two feet deep, then undermine the plants, and let them fall into the trench with their roots entire:—the ſame mode is neceſſary with other ſorts of trees, very much of their future ſucceſs depending on this point, their being well taken up.

ſimilar ſubſtances; but other ſorts of manure ſhould always be applied with the previous crops, and not thoſe of the tree kind*. The method of cropping muſt depend on the nature of the land and circumſtances.

After the plants have been kept in the ſeminary for about two years, in moſt of the ſorts they ſhould be removed to this nurſery, and planted in rows or lines about twelve or more inches apart, according to their ſort, and from three to five in the rows, where they may remain for two years longer, and then be finally planted out.

The next thing to be attended to, where the ground has been properly drained, is that of preparing the land for the reception of the plants. In this buſineſs great care is neceſſary, as much depends upon its being in a good condition for the reception of the plants. It is performed by the plough or the ſpade, according to the different circumſtances of the land. When coarſe plants prevail, ſuch as heath, furze, broom, &c. they muſt be fully deſtroyed by ſtubbing, burning, or otherwiſe clearing away. When burning is practiſed, the aſhes ſhould be blended with the ſoil, as they are found of great ſervice in promoting the growth of the plants.

The mode of preparation by the plough on tillable ſites, and where the ſoil is thin, is the cheapeſt and moſt effectual of any. Where the land has been in tillage, it wants nothing more than two furrows, and an equal number of harrowings, to render it fit for the reception of the trees. But where it is in lay, a crop of oats, &c. ſhould be taken the ſeaſon before planting; or, if it is ſtubborn, a ſecond crop, perhaps of beans, turnips, or potatoes, will be neceſſary; previouſly ploughing and harrowing well, and laying the land up in a perfect method. A trench plough is frequently uſed for this purpoſe, which ſtirs the ground to the depth of twelve or fifteen inches. In this method it is eſſential to plough to the full depth each time.

When the ſpade is employed, which muſt be the caſe in ſteep ſituations where the plough cannot come, and where there are rocks, ſtones, or other obſtructions; in this method the beſt planters adviſe, that the holes or pits ſhould be made to the full depth of the ſoil, and ſufficiently large according to the ſize of the trees. For thoſe of eighteen or twenty inches in height, whoſe roots occupy about nine inches when ſpread out, holes of fifteen inches in diameter may be ſufficient. This muſt, however, be regulated by the judgment of the planter. As it is of great advan-

* Nicol on Planting.

tage to the trees that the turfy matter ſhould be well broken down and reduced before the time of planting, it may be uſeful to have holes made a proper length of time before the trees are put in, to admit of this being fully effected, eſpecially on the drier and more light ſoils.

From the deſire of early appearance, it has been too much the caſe to plant foreſt-trees of too great growth. It is obvious, however, that there will be not only much ſaving of expenſe, but a much greater certainty of ſucceſs, in planting ſmall young trees than ſuch as are large and of greater age. Such as have been in the nurſery two, three, or four years, according to their kind, may in common be the moſt advantageous as timber-trees. Mr. Nicol obſerves that "deciduous trees of all kinds, except the larch, of from three to five feet in height, being carefully raiſed with good roots, will generally ſucceed." He has, however, ſhown, that a one year's ſeedling larch, nurſed one or at moſt two years, will outdo all others of its kind in any ſoil or ſituation, and therefore adviſes planting trees of this age only. Firs of any kind will ſucceed better if under than above thirty inches, even in the moſt favourable ſoil and ſituation. Moſt generally thoſe of fifteen or eighteen inches in height are to be preferred. From this view of the ſubject, it may occur to ſome, that to plant ſeedlings only would be the moſt adviſable and leaſt expenſive method. That it would be the leaſt expenſive method is obvious; but, that it is moſt adviſable, except for the Scotch and ſpruce-firs, may, he thinks, be diſputed.

"As the chief property of any young tree, intended for tranſplantation, conſiſts in a multiplicity of healthy fibres; hence the neceſſity of nurſing, *in kindly ſoil*, for a year or two, all *tap-rooted* plants, for the attainment of this object, and that we may commit them to the leſs genial ſoil and more untoward ſituation with greater probability of ſucceſs. For, whether ſhall we ſuppoſe the plant which has both root and branch to make, or that which has the latter only, in the firſt ſeaſon after ſo important a change of habit, is more likely to ſucceed?—The latter, certainly. From which alone may be demonſtrated the cauſe why plants of this deſcription ſurpaſs thoſe of greater ſize, as above ſtated. Theſe are raiſed with unbroken, tuſty, and fibry roots; thoſe with maimed, lank, fibreleſs ones; nor do they, with the utmoſt ſkill and attention, bear ſuch proportion to the top. Conſequently, the fibrils cannot afterwards, by the utmoſt efforts of human art, be induced ſo immediately to ſeek paſturage for the ſuſtenance of the trunk." For though lopping may in a great meaſure obviate this, injury is thereby done to the tree. In all ſoils and ſituations it is the ſafeſt and leaſt expenſive method to plant young healthy well-rooted plants.

The circumftances to be next conſidered in this buſineſs are thoſe of the diſtance and manner of planting: on theſe points Mr. Nicol's directions are, that "for the moſt expoſed, bleak ſites, and barren ſoil, from thirty to forty inches may be conſidered as a good medium; varying the diſtance according to circumſtances. For, in an extenſive tract, it will hardly happen that there is not a variety of ſoils. Some parts may be deeper and more loamy; others more gravelly or rocky. In the former, the greater diſtance may be adviſable; in the latter, the leſſer.

"For leſs expoſed ſites, and where ſoil is found above ſix inches in depth, from four to five feet will be a good medium; varying the diſtance according to circumſtances, as above.

"For belts, ſtripes, or clumps, whoſe breadth or diameter does not exceed a hundred feet, lying in a bleak ſituation, and of thin ſoil, the margin, on all ſides, ſhould be planted at not more than two feet apart; the interior parts at three. Thoſe lying on a more ſheltered ſituation, and of deeper ſoil, may be allowed diſtance according to circumſtances. But narrow ſtripes, or ſmall clumps, even if the ſoil may be termed *good*, ſhould generally be planted *thicker* than a more extended maſs, that the plants may afford each other ſhelter.

"For the moſt ſheltered ſites, where the ſoil is deep, good, and where apparently every plant will grow, ſix feet will be a good medium diſtance. Wider than this, he cannot approve in any caſe whatever; becauſe, at this diſtance, the plants have room to grow till their thinnings become uſeful. But, even were this not an object, there is a greater; namely, that the plants may not grow too ſquat in their infancy, and that the "pruning-hook" be not much wanted in the formation of ſtately timber."

It is conceived that "he who who plants too thin, with the idea of ſaving trouble in thinning, deviates as widely from the right path, as he who thins none at all." It is therefore contended "that thick, rather than thin planting, is the ſafer ſide to err on. By which mode, alſo, there is a more equal crop on the ground, beeting or filling up vacancies being much leſs neeceſſary *."

Contrary to the common practice, it is ſuppoſed that thick planting is moſt neceſſary where the plants are largeſt, as the greateſt number die in theſe caſes.

In the Duke of Portland's plantations, where trees of various ſizes are planted in an irregular manner, the number upon an acre is uſually about two thouſand.

In reſpect to the manner of ſetting the trees in the plantations, it is probably the

* Nicol on Planting.

beſt method, except where vegetable crops are to be cultivated between, to plant without any regular order, though the line or row manner is frequently practiſed, as being the leaſt troubleſome and expenſive.

There is another point to be regarded in the planting of timber trees, which is, that of the moſt advantageous manner of intermixing the trees. Some have adviſed the planting in groups, to prevent the ſuppoſed injury of trees of different ſorts growing together: others, however, prefer the mixed method, not only as affording a better means of aſcertaining what ſorts of timber trees ſucced beſt, but as enabling the planter to protect them more effectually. It has been ſuggeſted that "it matters little whether we plant in diſtinct groups or in indiſcriminate mixture; provided, in the latter caſe, we ultimately retain the moſt profitable and flouriſhing kinds only. For, with the proviſo that moſt of the kinds evidently adapted to the ſoil and ſituation be planted according to the mode of thick planting, a ſufficiency of them will remain, after all others are thinned away, for a full and final crop. For inſtance: if it ſhould be ſuppoſed that the ſoil is beſt adapted to the oak; that it is deſirable to raiſe the moſt valuable kinds rather than the decorative; and that, excluſive of the larch for nurſes, and a few firs to enliven the borders, ſix kinds are to compoſe the mixture; plant two oaks for one elm, two elms for one beech, two beeches for one aſh, two aſhes for one birch, and two birches for one ſycamore. And thus will the plantation at once be formed, in uniform gradation, of kinds moſt likely to ſucceed each other, in the caſe of either diſagreeing with the ſoil or climate; and which alſo ſucceed each other in reſpect of value as timber: doing juſtice, at leaſt, to the patriotic intention of the planter, ſhould the firſt and more valuable kinds fail*."

It is of the utmoſt importance, as has been already ſeen, in raiſing plantations of the timber kind, eſpecially in bleak expoſed ſituations, that warmth and protection be afforded by the judicious uſe of trees of quick erect growth and numerous branches. It has been obſerved, that in all ſituations, and on all ſoils, except thoſe termed humid, and which are adapted to the aquatic kinds only, the larch is without doubt the moſt proper nurſe, and therefore ſhould take preference of all others for this purpoſe. But that on ſub-humid, or loamy ſoils, the Lombardy poplar and Huntingdon willow are good ſubſtitutes; and, when variety is the object, ought to be mixed with the larch, for the purpoſe of nurſing the other more valuable kinds. And that on elevated, poor ſites, the mountain-aſh, for the firſt ten or

* Nicol on Planting.

fifteen years, is outdone by the larch only, in the office of nurſing, and is juſtly admitted for the ſake of variety. In all ſituations, this plant grows quickly in youth. In maritime ſituations, the ſycamore is likewiſe eminently uſeful for this purpoſe. "Few trees, except the above, grow faſter in youth, and none are more patient of the ſea-breeze. Conſequently, when the ſite is much expoſed thereto, this tree ſhould be freely planted in mixture with the larch for nurſing the oak, beech, elm, &c. if the intention be the culture of ſhip-timber*." The common pine may ſometimes be uſeful in this view, and afford greater variety. The proportion in which trees of this ſort ſhould be employed, muſt obviouſly depend on the peculiarity of the ſituation, and other circumſtances. Some recommend in thin ſoils, and bleak ſituations, tree for tree; and in leſs expoſed ſituations, and better ſoils, one nurſe for two principal trees; and in moſt ſheltered ſituations, with good ſoil, one nurſe for three, four, or five principal trees may be a ſufficient allowance. On the moſt expoſed and bleak ſituations, where the ſoil is evidently ſterile, the ſafeſt way is to plant too many rather than too few†.

We come now to the buſineſs of planting out the trees. The ſeaſon for performing this to the moſt advantage, and with the greateſt chance of ſucceſs, muſt differ according to the nature of the ſoils and the plants, as well as the ſtate of the weather. In the more porous dry ſoils, with the hardier ſorts of trees, the autumn, as from the middle of October to the latter end of November, may be the moſt ſuitable; as they will be better eſtabliſhed againſt the ſummer heats, which are often deſtructive to new planted trees. But in the more heavy and moiſt ſoils, eſpecially thoſe of the clayey and loamy kinds, and with the leſs hardy ſorts of trees, the early ſpring ſeaſon, as from the middle or latter end of February to the beginning of April, may be the moſt proper. The condition of the land ſhould be particularly attended to in this buſineſs, as it is equally improper to plant when either in too dry or too moiſt a ſituation. It has been well remarked, that "at a time when the ſoil is neither wet nor dry, the operation of planting is moſt eaſily, and alſo moſt ſucceſsfully, performed. The mould adheres not to the ſpade, nor does it *run in*; it divides well, and with little trouble intermingles with the fibres; nor, in the operation of treading and ſetting the plant upright, is it wrought into a mortar, to the evident prejudice of the plant, whatever weather may enſue. Conſequently, on a retentive ſoil, it cannot be proper to plant in time of rain, nor

* Nicol on Planting. † Ibid.

in many cafes for a day or two afterwards; nor after a fall of fnow, until for feveral days it has entirely difappeared. Whereas, on a dry abforbent foil, it may be very proper to plant in time of gentle rains, immediately after heavy ones *," or on the fnow difappearing.

The differences in the forwardnefs of the vegetation of different forts of trees fhould alfo regulate in fome meafure the time of planting, where thofe of the fame forts are only made ufe of. In this view, it is advifed that the larch, elm, fycamore, lime, horfe-chefnut, mountain-afh, birch, alder, poplar, willow, &c. fhould be put in by the beginning of March; and that the oak, birch, afh, chefnut, hornbeam, &c. be finifhed planting by the beginning of April at the lateft. The beft feafon for the planting of many trees of the evergreen kind, fuch as the Weymouth pine, fpruce, Scotch, filver, and other firs, is fuppofed by fome to be in the latter end of July, or in the following month, when the weather is moift or cloudy.

After the trees have been taken up with care, fo as to injure the fibres of the roots as little as poffible, and a few of the bruifed extremities cut off, they fhould, when intended to be planted in mixture, be put together in proper proportions, and conveyed in this way to the place where they are to be planted. They muft then be diftributed on the ground, at the pits or other places, in order to be ready for the planters, as by this means much time is faved, which would otherwife be loft in forting. But to prevent the roots from getting too dry, it is neceffary not to take up, or bring on to the land, more than can be planted in a fhort fpace of time. This fhould invariably be the practice. Where only one or two forts of trees are however to be planted, the ufual practice of carrying the plants along as the planting proceeds may be the moft convenient method.

The operation of planting is the beft and moft expeditioufly performed by two perfons; a man to do the work, and a boy to hold the plants. In performing the bufinefs, the labourer firft ftirs the mould well in the holes or pits that have been previoufly prepared, rendering it level, and fit for the reception of the plant; form new holes according to the mode of planting. The boy then places the plant in the hole with all the fibres of its roots regularly fpread out and unconfined, to the depth of about an inch more than it had ftood in the nurfery, holding it perfectly upright; while the man gently fills in the loofe mould, moving the tree a little up and down to let it mix with the roots: the remainder of the earth is

* Nicol on Planting.

afterwards put in; and then the labourer proceeds to the preparation of the next hole, leaving the boy to ſet the plant erect and cloſe the mould about it, which in ſoils of the ſtiffer ſort ſhould be only performed in a light manner, but in thoſe of the drier kinds, as the ſandy and gravelly, as cloſe as poſſible. In this way the work is to proceed till the whole is finiſhed. There are other methods of planting, as by forming ſlits, nicks, or openings of other kinds, ſo as juſt to ſqueeze in the roots of the plants: but theſe never ſucceed well.

Much of the ſucceſs of the planter depends upon having this part of the work well executed; but great care ſhould be taken, particularly where the land is inclined to moiſture, or of a retentive quality, not to plant at too great a depth. In planting on ſteeps, it is directed that the trees ſhould be placed towards the declivity, being planted at the loweſt part of the opening; which ſhould, in completing the buſineſs, be left the higheſt, by which the moiſture may be better preſerved.

It ſeems not improbable, but that in many caſes and ſituations the planting of ſmall trees of the timber kind might be performed with great convenience and expedition by the aſſiſtance of a plough ſuitable for the purpoſe, as has been ſometimes practiſed in ſetting hedge-plants.

In the planting of trees of conſiderable growth, great attention is neceſſary to have them well ſecured againſt the wind, as, when they become looſe, the fibres are ſo broken and deſtroyed that they ſoon die. This has been commonly effected by means of ſtaking: but as in this way the trees are often in danger of being injured by rubbing, a practice of ramming the earth cloſely about the roots has been attempted, which in ſome ſoils, and upon ſmall ſcales of planting, has it is ſaid been found to ſucceed; but in extenſive concerns it is wholly inadmiſſible, from the trouble that muſt attend it.

When the plants have been all put in, it is a practice with ſome to ſow or ſet the plantations with acorns, as it is found that ſown oaks as well as other trees exceed in growth thoſe that are planted. This work is done either by paring off the ſurface with a mattock, and ſetting the acorns with a dibble, orby putting them in ſhort drills by the hoe at the diſtance of about ſix inches. The beſt ſeaſon for performing this buſineſs is in April, and it may be effected the firſt, ſecond, or third year after planting*; but the firſt or ſecond is probably to be preferred. Great care ſhould be taken to

* Nicol on Planting; and Nottingham Report.

preſerve the acorns well, by expoſure to the air and frequent turning for this purpoſe, as they are very apt to ſprout ſoon after being gathered *.

After the trees have been planted, it is neceſſary not to loſe ſight oft he plantation. The young plants muſt be kept clean and free from the annoyance and choking of coarſe weeds of all kinds, for at leaſt three or four years. This may be effected by the hoe in many caſes; but ſome have recourſe to the culture of different ſorts of crops in this view. In this method, however, much care is requiſite not only to avoid injuring the plants, but to guard againſt the ſoil being too much impoveriſhed, and their growth thereby much reſtricted.

Where coarſe plants abound, ſuch as broom, furze, briers, and other ſimilar productions, in all the leſs expoſed ſituations, they ſhould be wholly cut up and deſtroyed; but in bleak expoſures it may be a better practice to only clear them to a diſtance round the trees, ſo as that they cannot do any injury by rubbing or ſtriking againſt them, the other parts being left for the purpoſe of ſheltering and protecting the young trees.

There is another point not leſs requiſite to be attended to in young plantations, which is that of filling up the vacancies that are cauſed by the dead plants. Where the ground is kept perfectly clean, this may be done at any proper ſeaſon; but in other caſes, when the dead plants cannot be ſo eaſily detected, it may be better to delay the buſineſs to the third or fourth year, when the deficiencies can be more perfectly aſcertained. If this ſort of buſineſs be done too early, many plants are frequently removed that would have thrown out from the bottom, on account of their not being dead in that part, though wholly gone in the top.

The plants employed in filling up the plantations ſhould never be too large, as, where that is the caſe, they are more liable to die.

There is another kind of planting which is frequently practiſed, but the propriety of which ſtill remains a deſideratum. This is that of ſetting the hedge-rows with trees of the timber kinds. Some contend for the utility of the practice, on the

* *Quantities per Acre.*

Acorns, four to ſix ſtrikes.
Aſh keys, four ſtrikes.
Spaniſh cheſnuts, one ditto.
Hawthorn berries, one ditto.

It is neceſſary to bury the aſh keys and hawthorn berries one year in beds or pots of ſand before they are ſown in plantations.

grounds of the degree of ſhelter and ornament that is afforded, as well as its being a means of raiſing much uſeful timber at little or no expenſe; while others condemn it, as highly improper and diſadvantageous, on the principle that much injury is not only done to the crops, eſpecially when of the grain kind, both by the dropping and the ſpreading of the roots, but alſo to the hedge in the places where they ſtand, by their producing gaps and openings. But though ſome inconvenience and injury may be ſuſtained where this ſort of planting is much in uſe in arable diſtricts; yet from theſe being in a great meaſure capable of being obviated by proper training and pruning, and from the naked appearance which is exhibited without them in a country, but more particularly from the vaſt benefit that may be derived in the way of timber *; it would ſeem that ſome extent of planting in this method ſhould be attempted in moſt ſituations. But in performing the buſineſs the nature of the land, the ſort of huſbandry that it is principally conducted under, and the kind of expoſure in which it is placed, ſhould be well conſidered, and the ſort of trees properly adapted to it. In dry ſoils, moſt ſorts of timber trees, as has been ſeen, may be planted; but in thoſe more ſtiff and heavy kinds, the oak and the elm may be the moſt proper. The aſh ſhould, perhaps, never be had recourſe to where the land is almoſt wholly under the plough; but on lands under the grazing or graſs ſyſtem, it may be planted with advantage. In bleak and expoſed ſituations, the beech is probably the beſt for this uſe; and near the ſea the ſycamore. The trees where the ground is moſtly in an arable ſtate ſhould be planted at much greater diſtances than under the contrary circumſtances, and ſuch trees as run moſt to tall clear ſtems be preferred.

The young trees for this ſort of planting ſhould be larger than in other caſes, being kept in the nurſery two years longer than has been adviſed above, and

* It has been obſerved by Mr. Middleton, "that it would not be an eaſy matter to make an accurate eſtimate of the advantages to be derived from ſuch a meaſure; but in order to gain a ſlight idea as to the quantity of hedge-row timber, let it be conſidered that, in well incloſed, hedged, and cultivated diſtricts, the hedge-rows occupy from a twentieth to a tenth of the whole ſurface. Even including the common fields, and cultivated ſlopes and borders of ſheep-downs, the average quantity of land occupied by hedge-rows at this time amounts to a twentieth, or two millions of acres: *all* of which might, probably, be made to produce timber: more than *half* of it, however, would no doubt do ſo, by only trimming the loweſt ſide branches off to the height of ten, twelve, or fifteen feet from the ground. This would permit the air to circulate freely; give every advantage to the occupier's crops; and would leave ſufficient tops upon the trees for all the purpoſes of growth and rural ornament. Under management like this, the hedges would every where preſent healthy, vigorouſly-growing, and handſome timber; would add very much to the profit of the land-owner; to the ſecurity of the country; and to the pleaſures of the traveller."

ſhifted ſo as to produce more fibrous roots. When about five or ſix feet in height they are probably in the moſt ſuitable condition for being removed into theſe ſituations.

The moſt proper time of planting in hedge rows, is when the fields are firſt broken up from the ſtate of lay, as at that time, from their being continued in the ſtate of tillage for ſome years, there will be leſs trouble and expenſe in protecting them from cattle by palings, &c. as well as leſs danger of their being injured by the browſing of live ſtock, as they will be advanced beyond their reach by the time the land is reſtored to graſs. Where the planting is performed in the hedge-rows of graſs lands, the trees muſt always be perfectly ſecured from the croppings of cattle, as well as the rubbing of ſheep, or other animals, as, where this is not the caſe, they are ſoon deſtroyed.

The planting in theſe caſes ſhould always be carefully performed in the manner that has been already deſcribed; and where the trees do not ſtand perfectly firm againſt the wind, they ſhould be well ſecured by ſtakes, or other proper means, as they never thrive well when not perfectly faſt.

The barbarous practice, too frequently made uſe of in different diſtricts, of converting the hedge-row timber trees into pollards by lopping off their top branches, ſhould in all caſes be guarded againſt as much as poſſible, as it is the deſtruction of timber. Where pollards abound, they are moſtly cropped once in from about nine to fifteen years, the profit of which moſtly belongs to the tenant. This work ſhould be conſtantly finiſhed by the end of February.

In plantations of timber and other ſorts of wood, it is neceſſary to attend to the proper pruning and thinning of the trees occaſionally as they advance in their growth, in order to prevent their growing in an improper manner, and their injuring each otherby rubbing or being drawn up weak. In the firſt view they are therefore to be occaſionally looked over after the third ſeaſon from planting, and ſuch headed down, or otherwiſe cut, as may appear neceſſary for their more perfect growth. When this has been done, the only thing further will be to encourage a leader, by ſhortening all the other branches that appear to contend with it to nearly one third of their length, in order to ſtrengthen the main ſtem. The whole that is afterwards neceſſary is that of properly thinning the ſtrong top branches, and thoſe on the ſides, which may be done by a light bill. This is applicable to trees of the foreſt kind; but thoſe of the fir and evergreen ſort require nothing more than the regulation of their leaders, as that of keeping them ſingle where they throw out double. The leſs the ſide branches are touched the better.

The proper thinning of plantations or woods is a matter of the greateſt conſequence to the growth of the trees, as where they are too much crowded they are apt to be drawn up weak. In mixed plantations the nurſe trees ſhould be firſt gradually thinned out, beginning with thoſe of the moſt inferior kinds, few of which ſhould be ſuffered to remain after ten or fifteen years. In performing this buſineſs much muſt be left to the judgment of the operator and the circumſtances of the plantations; but the chief rule is to keep the extremities of all the ſide branches ſo as nearly to touch each other, and to have a due regard to the diſtance of the tops, not the roots of the trees, as ſome require much more room than others*.

In the plantations in Nottinghamſhire, about the fourth or fifth year after planting, the ſmall-ſized birch and ſeedling oaks are grown to a proper ſize for tranſplanting. In the thinning of theſe, care is had not to take too many away in one ſeaſon; as by being properly managed a ſupply of plants for at leaſt half a dozen years is provided. About the ſame time that the ſmaller-ſized birch wants thinning, the large ones require to have their lower branches taken off, ſo as to keep them from injuring the oaks: and this is the firſt profit of the plantations, the birch-wood being readily bought up by the broom-makers. This pruning is continued as often as required, till the birches are grown to a ſufficient ſize to make rails for fencing; they are then cut down, to make room for better trees. By this time the oaks are grown to the height of twelve or fourteen feet, when they draw themſelves up exceedingly faſt. After the birches are cut down, there is nothing more to do but thinning the oaks from time to time, as requiſite, and cutting off their dead branches as frequently as may be neceſſary. In performing the firſt, much caution is required; for, if length of timber can but once be obtained, time will bring it into thickneſs; they are therefore let grow very cloſe together for the firſt fifty years. In reſpect to the progreſs of the oak in two plantations, one of twenty-eight, the other of fifty years growth; in the former the trees were in general about twenty-five or twenty-ſix feet in height, and in girth about eighteen inches; but in the latter ſomething more than ſixty feet in height, and in girth a little above three feet, being in general about fifty feet in the bole. Plantations of the fir kind require leſs thinning than thoſe of other trees.

The thinning of underwoods muſt be regulated, in a great meaſure, by the luxuriance of their growth, and the purpoſes to which the cuttings are to be applied: when for the larger uſes, more thinning will be neceſſary than in the contrary caſe.

* Nicol's Treatiſe on Planting.

There is another ſort of planting which in many ſituations, ſuch as thoſe of the moiſt boggy ſort on the borders of rivers, is extremely advantageous; this is that of the willow or ozier, for the purpoſe of the baſket makers. The method of planting in theſe caſes, on the banks of the Thames, is thus deſcribed in the Tranſactions of the Society for the Encouragement of Arts, &c.

"The ground is dug during the winter a full ſpade's depth, and left rough, to prevent the tides from running it together again before it can be planted.

"The work begins in the month of March. The planter having procured the ſets or plants, which are fifteen or ſixteen inches long, cut diagonally off the ſtrongeſt ſhoots of the laſt year's growth, care being taken that they are not cut near to the top of the rods, that part being too porous to make a ſound plant, the ground is then marked out into rows two feet aſunder; and the ſets are ſtuck in the rows, eighteen inches from each other, leaving about ſeven inches of the ſets above the ground. This work is very eaſily done, without uſing even a dibble or a ſetting-ſtick; but, when planted, care muſt be taken, by hoeing, to keep them as free from weeds as poſſible; or, if the ground be too wet for the hoe, a weeding-hook may be uſed to keep them down: this is abſolutely neceſſary to enſure a good plantation. It is alſo equally neceſſary to keep the ground well drained, to prevent the tides remaining upon it any conſiderable time, for on that alſo depends the firmneſs and good quality of the rods.

"The willows are cut over the firſt year with a bill-hook; the ſhoots are cut off cloſe to the ſtock, and bound up in bundles, or *boults*, as they are called, which meaſure forty-two inches round, at ſixteen inches above the butt ends. The ſame proceſs of weeding muſt be purſued every ſummer, while they are ſhooting up from the ſtem. The next cutting ſeaſon a portion of them is left to ſtand another year, where large ſtuff is wanted for the ribs of large baſkets, &c.

"The planting of willows is expenſive the firſt year; but if well managed they produce a great profit, as they improve in quantity every year*."

As the demands for this ſort of produce are very great, wherever the farmer has lands that are ſuitable for this kind of culture they ſhould not be neglected. On

* The names and uſes of the ſpecies employed in the vicinity of Brentford are thus deſcribed:

"1ſt. The *ſalix vitallina*, or yellow willow, which is cultivated chiefly by the nurſerymen, and being of a tough yielding nature, is uſed for binding packages of trees and ſhrubs in the drawing ſeaſon, and for tying up the branches of wall and eſpalier trees.

"2d. The *ſalix amygdalina*, or almond-leaved willow, is a ſpecies of which there are ſeveral varieties, one of which is called by the planters "the ſmall red willow," or "binding rod;" it being chiefly uſed

ſuch moiſt boggy ſoils the cultivation of the Huntingdonſhire willow has alſo been found extremely profitable when grown for the purpoſe of hop-poles*.

Management of Woods.—It is always a convenience, and in many caſes and ſituations a very profitable thing, to have woods for the purpoſe of cutting for the uſe of the farm, or with the view of ſale; but in either intention it is abſolutely neceſſary that they be kept in a good ſtate of preſervation from the deſtructive browſing or croppings of cattle, by proper fences, and well ſtocked with the moſt uſeful ſorts of wood that are capable of being grown to advantage on the peculiar ſoil and ſituation, as, without due attention in theſe reſpects, from moſt of the ſtocks that afford the wood "being in fact only pollard trees growing under ground, it is obvious that the produce of ſuch ſtocks muſt, like the ſhoots of pollard trees, be the moſt abundant when the parent ſtocks are in the greateſt perfection; that until they attain that perfection, it muſt be ſmall; and that, when paſt that perfection, they gradually decline; the ſhoots from them become weaker and fewer every ſucceſſive cutting, and the ſtocksfinally decay and die. To prevent the decay of woods, it is neceſſary of courſe, from time to time, to renew them by raiſing new ſtocks to ſupply the place of thoſe which gradually wear out or are deſtroyed. But beſides the regular decay of age, to which all woods are liable, there are other injuries to which they are expoſed, and which ſpeedily and prematurely bring on their decay, unleſs prevented by proper means. One is the pernicious cuſtom of ſuffering cattle to feed in woods, under an idea that, after they are of a certain age, as ſeven years, the ſhoots are grown out of the way, and cannot be hurt. In ſtrong thriving woods, it is poſſible that cattle may do but little harm to the underwood, after it is ſeven or

for binding the produce of garden-grounds. Another kind of this willow is at preſent known by the looſe appellation of the "new kind;" it is of large growth, and produces a great crop; is uſed both by the baſket-makers and the corn ſieve-makers, and is fit for any work which requires a firm as well as a tough rod.

"3d. The *ſalix viminalis*, or ozier willow—Of this ſpecies there are alſo ſeveral varieties, which are called among the planters by the name of "the yellow and brown oziers, or, "Comb's oziers." They are chiefly uſed by the baſket-makers, being very pleaſant working rods, and, as they produce a great crop, are much cultivated.

"Theſe three deſcriptions comprehend the moſt uſeful varieties, and are the moſt profitable in point of crop, of any that are cultivated in this diſtrict. There is, however, a coarſe ſort of willow, known by the name of "the Spaniard:" but whether it is a diſtinct ſpecies or not is not decided: it might be rendered extremely uſeful in counties where much bruſh or underwood is bound."

* Corrected Report of Nottinghamſhire.

eight years old; but all the young plants, which either ſpring up ſpontaneouſly or are planted in them, muſt be liable to be cropped and kept down, and few of them can come to perfection. And in weak decaying woods, there is always a great deal of the underwood ſo low as never to get out of the reach of cattle, but conſtantly liable to be cropt and kept down by them, and the decay of the ſtocks conſequently much haſtened. Another cauſe of the early decay of woods, is the want of draining ſuch parts of them as are ſubject to be moiſt and damp; nothing being ſo prejudicial to wood as too much wet. This begins to be well underſtood in moſt draining diſtricts, and has been practiſed with ſucceſs. A third cauſe of decay, is the cuſtom of ſuffering woods to grow too old before cutting; whereby the ſtrong ſhoots ſmother the weak ones, and, by their dropping, kill the ſtocks on which they grow. And to this may be added the practice of permitting the buyer to cut the wood, thereby making it his intereſt to deſtroy every ſapling, and to cut the underwood as cloſe to the ſtock as poſſible—which in old woods is highly prejudicial to the ſucceeding ſhoots—as well as the cuſtom of not obliging the buyers to clear the woods early in the ſummer, ſo as to prevent the new ſhoots from being injured by their cattle, carriages, and other circumſtances*.

In forming or improving woods of the coppice or underwood kinds, it is particularly neceſſary to pay attention to the nature of the ſoil as well as that of the aſpect; and to adapt the trees and plants to the nature of theſe as much as poſſible, at the ſame time taking into the conſideration the kinds that are moſt uſeful and moſt in requeſt in the diſtrict or immediate vicinity, as from its bulky nature it is in general the moſt profitable when diſpoſed of without the trouble of much carriage. Various ſorts of plants and trees, as has been ſeen above, may be employed in this way, according to the ſtate of the ſoil; but it has been obſerved that "taking the general demand of countries, and the peculiarities of different ſoils, into conſideration, there is no kind of wood ſo generally proper for planting in this way as aſh. The value of aſh-poles being at leaſt one-third more, and frequently as much again, per hundred weight, as that of other poles (being applicable at all ſizes to ſome uſeful purpoſe or other); the timber being always in requeſt, and ſaleable at any age or ſize, at almoſt the price of oak; and the wood itſelf being as quick a grower as any, and quicker than moſt; and above all, there being but few ſoils, from the blackeſt and wetteſt bogs to the higheſt and moſt expoſed mountains, where

* Davis in Bath Papers.

it will not grow; are reaſons why aſh is one of the moſt profitable woods to plant in ſuch coppices as are favourable to its growth. But in ſoils and ſituations where aſh does not grow kindly, let ſuch other ſorts of woods be planted as appear to thrive beſt in ſimilar ſoils and ſituations in the ſame country. Spaniſh cheſnut, though not ſo general a grower as aſh, is a moſt excellent wood, either for timber or underwood, and wants only to be more known to be higher in eſtimation. It partakes much of the properties of oak, but excels it in two points, viz. that it grows faſter, and that the ſap part of the timber is firmer and leſs corruptible *."

If it be profitable to plant new woods, it is certainly much more ſo to protect thoſe that are already planted, to fill them up where thin, and to reſtore them when in a ſtate of decline. The expenſe in this way is not only leſſened by the ſaving of new fences, but the profit is greatly increaſed, by the rapid growth of the wood, when planted in ſituations that are ſheltered by other trees and plants already planted. In woods where ſaplings riſe in great numbers ſpontaneouſly, their growth ſhould be encouraged. As, at the time of cutting the underwood, ſuch ſaplings may, perhaps, be 14 or 15 years old; it might appear proper, after leaving for timber trees ſuch as are ſtraight and handſome, to cut off the reſt for underwood; but a great part of the ſaplings at that age ſo cut off will not be large enough to produce ſhoots ſufficiently ſtrong to get up as faſt as the other underwood. Theſe ſhoots would therefore ſuffer, and the ſtocks never come to perfection. It is conſequently, in general, more adviſable not to cut off ſuch ſaplings as are intended for underwood, until the ſecond cutting of the wood, when they may be probably near 30 years old, and will then throw out ſhoots ſtrong enough to fight their way, and keep pace with the ſurrounding underwood. But where ſaplings do not ſpring up in abundance in this way, young trees muſt be planted; part of which may be preſerved for timber, and the reſt left to be ſtubbed off for underwood at a proper time †.

For the purpoſe of filling up ſuch woods as are "grown thin by age or neglect, the proper time is one year, or at the utmoſt two years, after the underwood is cut. The young plants ſhould be eight or ten feet high, and an inch and a half in diameter at the ground, and ſhould be planted without cutting off. If the ſoil be dry, no other preparation is neceſſary than barely digging the holes for the plants. If wet, deep drains ſhould be made to take off the ſuperabundant water. The

* Davis in Bath Papers. † Ibid.

earth dug from theſe drains being thrown out on the lower ſide of them, upon this new earth the plants ſhould be planted. If land of this latter deſcription be black and peaty, aſh is peculiarly proper for it; and will, if planted on the earth thrown from the drains, make a moſt ſurpriſing progreſs. If it be a ſtiff yellow clay, it is generally more favourable to the growth of oak than of aſh. In ſuch ſoils, oak for timber, with a mixture of willow, birch, alder, and Spaniſh cheſnut for underwood, will perhaps be the moſt proper. All theſe kinds ſhould ſtand one round of the underwood, and, if ſtill weak, ſhould ſtand two, before thoſe are cut off which are intended for underwood. Birch plants however are an exception to this rule: they ſhould always be cut off the firſt round of the underwood; for, if they are large when cut off, the ſtocks frequently decay and die. In all mixtures of kinds of wood for coppices, thoſe ſorts ſhould be uſed which are not unfriendly to each other, and which will come round fit to be cut together at the ſame periods; and ſuch kinds ſhould be allowed to ſtand for timber, and that at ſuch diſtances as to injure the underwood as little as poſſible. The plants for filling up old decayed woods ſhould be the ſtrongeſt and beſt of their kinds; and thoſe which are weak at firſt will be drawn up by the ſurrounding underwood, and become from their increaſed height ſtill weaker. At the next cutting of the underwood, they will be blown down; or, if cut off, the ſhoots will be too weak to grow up with the other underwood. Oak, aſh, and Spaniſh cheſnut ſhould be kept in a nurſery for this purpoſe: alder and birch plants grow plentifully ſpontaneouſly in ſome countries, and may be taken up for uſe. Alder is ſometimes propagated by taking up old roots and dividing them into ſeveral parts; and hazel may be raiſed in the ſame way. Willow is generally planted in cuttings; but a much better way, where there are any old willow ſtocks, is to plaſh down the ſhoots to fill up the vacant places round ſuch old ſtocks*."

It is a queſtion which has not yet been fully decided, and which can only be well aſcertained by trials made upon a number of poles or ſtems of different ſorts of wood at different growths, as ſeven, fourteen, and twenty-four years, to ſee whether the increaſe is in proportion to the length of growth. In this way, proper attention being paid to the nature of the ſoil by nice obſervation, in time a correct and uſeful eſtimate might be obtained of the moſt advantageous periods of cutting woods. The practice of cutting differs in different diſtricts, from ſeven or eight to twenty-five or thirty years; but the moſt common is probably from

* Davis in Bath Papers.

twelve to fourteen or eighteen. There is alſo a practice in ſome wood counties of leaving one or two ſtems upon each ſtool for a double growth, by which a portion of large wood may be procured in each fall. In this way it is probable that there may not be a much leſs increaſe in the growth of the other parts of the wood, while the largeneſs of theſe ſtems may afford more profit, and admit of being applied more generally and to more important uſes. If there are cauſes that cannot be obviated, ſo as to prevent cattle from injuring the early growth of woods, it muſt obviouſly be the moſt profitable method to defer the cutting to as late a period as poſſible, from the miſchief being chiefly in the firſt few years. For many uſes it is impoſſible to cut at the more early periods, except on very good ſoils indeed. This is the caſe with aſh and oak, for hop-poles, and ſome other ſorts. On the whole, it ſeems therefore probable, that the moſt profitable method may in general be to defer cutting till the later periods.

In the extenſive woods of Buckinghamſhire, where the produce is chiefly beech, it is the practice not to cut till from twenty-five to thirty, or even thirty-five years, by which means they conſiſt almoſt wholly of ſucceſſions of young trees. In the cutting, the trees of a proper age are annually ſingled out and cut, without having recourſe to regular falls, as in other caſes. The extent of the cuttings is made ſo as to pay the proprietor from about fifteen to twenty ſhillings the acre, in proportion to the goodneſs of the growth. The beſt afford a clear profit of twenty ſhillings under this management*. In Worceſterſhire, where the woods are chiefly cut for the ſake of the bark, they are felled at about forty years growth, a proper quantity of ſtore woods of fourteen and twenty-eight years growth being left for the next fall. And in the neighbouring diſtrict of Hereford it is ſometimes the caſe to fell at from eighteen to twenty years growth, and in others at from twelve to fourteen or fifteen. In the former it is chiefly oak; but in the latter caſe aſh, ſallies, and alder. The whole is cut, and ſuch parts as are proper applied as hop-poles, with much profit. The twenty years falls are ſtored and applied in the uſual manner. In cutting-wood one *maden* ſtandard is left to each *lugg* or forty-nine ſquare yards. Coppice-wood will produce at from 2s. 6d. to 4s. 6d. a *lugg*, from twelve to twenty-two pounds the acre, at from twelve to fourteen years growth, which is a greater return than could be obtained in almoſt any other way in ſuch ſoils and ſituations†.

The Dillorn woods in Staffordſhire "form a chain of three or four miles in length, and conſiſt of tall ſtraight oaks and aſh, which are in general ſo well filled up with

* Buckinghamſhire 4to Report. † Herefordſhire 4to Report.

underwood as to be cut in gradual falls at ſeven years' growth, and produce when well fenced ſix pounds per acre; for rods and ſtaves, uſed for crates in the neighbouring pottery. Eighty-four acres of wood will admit of twelve acres being cut annually, and will produce ſeventy-two pounds; which is about ſeventeen ſhillings per acre per annum for the underwood, excluſive of the timber; while the bleak neighbouring hills which remain unplanted are not ſuppoſed worth more than three ſhillings per acre *."

It has been ſuggeſted by Mr. Davis, that "the periods of cutting underwood ſhould be regulated by the luxuriance of its growth, the demand of the country, and the uſes to which the wood is to be applied when cut. In the article of underwood, not only the intereſt of money, but the loſs of the ſucceeding growth, tell againſt the value of ſtanding wood after it is fit to cut, and make it doubly the advantage of the owner to cut his underwood as early as it is ſaleable. As ſoon, therefore, as any kind of wood is fit for the uſes of the country, it ſhould then be cut, unleſs it can be made appear that it will pay compound intereſt for ſtanding longer, or, in other words, will pay not only the ſimple intereſt of the firſt value, but alſo the loſs of ſo many years growth of the wood, as ſo far advanced towards another crop. Wood merely for fuel can ſcarcely be cut too young. Hazel is uſually fit for hurdles and dead hedges, from nine to twelve years old; aſh for ſheep cribs, at the ſame age; and aſh and other woods, for hop-poles, from eleven to fourteen years old: while aſh for carpenters and other large uſes, alder, birch, and willows for rafters, turners' uſes, pattens, clogs, and coalpit uſes, ſhould ſtand from ſixteen to twenty years before the poles are large enough for their reſpective purpoſes."

The buſineſs of cutting wood uſually commences in November, and may be carried on through the winter months till February or March; but ſhould be completed before the beginning of April, except where the wood is to be barked; in which caſe the beginning of May may be the moſt proper, as it will then generally *run* the beſt.

Opinions have differed much, Mr. Davis obſerves, "reſpecting the moſt proper time of the year for cutting underwood; but there is one rule which, on the ſeller's part, is without exception, viz. that the older the wood is, the later in the ſpring it ſhould be cut. When old wood is cut early in the winter, and a hard winter follows, the damage done to the ſtocks is very great; young flouriſhing wood will bear cutting at any proper ſeaſon. But on the part of the buyer it is allowed that all woods are more durable, when cut in the moſt ſtagnant ſtate of the ſap; and in all

* Staffordſhire Corrected Report.

uſes where bending is required, ſuch as hurdles, hoops, and even dead hedges, the wood cannot be cut too early in the winter, being, if cut when the ſap is riſing, brittle, and unfit for thoſe purpoſes." Oak underwood, as bark ſells at preſent, may pay well for ſtanding till the ſap is up for barking, and the ſtocks will ſeldom be much hurt by the practice.

The work of cutting wood is moſtly performed by meaſure, or what is ſometimes termed tale. The wood is differently managed in different diſtricts; in ſome it is merely cut and laid in rows or drifts, being diſpoſed of in that ſtate by the rood or other meaſure. In other caſes it is regulated according to its uſes, being ſorted by the farmer into hop-poles, hoop-ſtuff, hurdles, faggots, ſtakes and edders, &c. which is probably the moſt advantageous practice; but the farmer ſhould be cautious in liſtening to the advice of workmen on theſe occaſions, as they moſtly ſuggeſt that method which will be the moſt beneficial to themſelves.

PRACTICAL AGRICULTURE,

SECTION XIII.

Live Stock.

*LIVE STOCK—Importance of—Great Attention to—Further Improvement of neceſſary—Additional Facts and Experiments wanting for—Circumſtances to be attended to in—Shelter and Warmth with a high Degree of Fertility of Paſture uſeful—Syſtems of Practice purſued in, different—Croſſing the Breeds—Suppoſed Advantages and Diſadvantages of—Though uſeful, ſhould be practiſed with Caution—Injury eaſily done by it when injudiciouſly performed—Various Proofs of—Breeding in-and-in—Advantages of this Method—What neceſſary to be regarded in—Principal Object of the Farmer in, Profit—Form of Animal moſt proper for—Properties to be regarded in—Shape—What neceſſary in—Moſt perfect Kind of—Which moſt advantageous in the View of the Grazier—The moſt perfect probably beſt—Size—Queſtion concerning not fully ſettled—Opinions differ from the Quantity of Food conſumed not being well aſcertained in—A Number of ſmall Animals conſume leſs than of large ones—Mr. Knight's Opinion favourable to large Size for fattening—Conſumption of Food not in proportion to Size—Advantages of ſmall-ſized Animals—Smaller Sizes beſt for Milk—Reaſons of ſtated—Sizes of muſt be much regulated by Paſture or Herbage—On rich Paſtures large Breeds moſt profitable—On inferior ones, the ſmaller Sorts—Tameneſs of Diſpoſition—Great Utility of in domeſtic Animals—Hardineſs a deſirable Property in—Marks of—Early Maturity—Advantages of to the Farmer—Circumſtances moſt favourable to—Good Feeding and Warmth while young—Quality of Fleſh—Probably depends on Breed, and not on Size of Animal—Goodneſs of Flavour in ſome meaſure on Food—Badneſs of Colour, perhaps morbid—Appearances of good Meat—Effects of Difference of Age on—Diſpoſition to fatten—highly neceſſary to be attended to—Principle of not fully inveſtigated—Much influenced by Form and Breed in Mr. Bakewell's Practice—Advantages and Diſadvantages of too much fattening—Fattening the only Mean of producing good lean Meat—Much Attention to this Property neceſſary in raiſing Live Stock—Hide—Neceſſary Feel of—Utility of in expoſed Situations—Property of ſupplying Milk largely—Nature of Animals for—Should probably be an excluſive Breed for—Sir John Sinclair's Opinion of a Breed ſuited for this Purpoſe and that of the Grazier's—Aptitude for Labour—a Property neceſſary in certain Circumſtances—What proper to be conſidered in—Blood or inherent Quality of a Breed—Utility and Advantages of in breeding Animals—Much Regard neceſſary to all theſe Properties in Breeding—Modes of conducting the Buſineſs—Succeſs of, on what depends—Choice of Live Stock—Various Circumſtances to be conſidered in—Vaſt Advantage of improving Live Stock ſhown—*NEAT CATTLE*—Breeds of very numerous—No perfect Arrangement of—Methods that have been attempted in—By the Horns—By the Names of the Counties or Diſtricts where they prevail moſt—Different Breeds of deſcribed—Long-horned—Middle-horned—Short-horned—Welch Breed—Suffolk Dun Breed—Polled or Galloway Breed—Kiloe Breed—Fifeſhire Breed—Alderney Breed—Wild Breed—Nature and Properties of each explained—Different Breeds proper for different Purpoſes of the Farmer—Circumſtances to be regarded in this Intention—Cow-Stock—Means of providing good Sorts of—Breeding and rearing young Stock—What neceſſary in—Farms proper for—Beſt Methods of in different Circumſtances—Kinds of Food moſt advantageous for—Winter Management of—Manner of ſoddering of—Queſtion of being tied up or looſe conſidered—Summer Paſture for—Proper Age of putting Heifers to the Bull—Time of—Beſt Seaſon for Calving—In Calf-Stock ſhould be well fed—Bulls—Duration of Vigour of—Should be well ſupplied with Food in rearing of—Bakewell's Practice in—Oxen for Labour—Proper Management of, in Hereford ſhire and Devonſhire Kinds—Time of bringing into Work—Beſt Modes of ſhoeing of—Age of Cattle how aſcertained—Diſeaſes of—Scourings—Yellows—Bloody Urine—Foul—Wounds—Remedies proper for—SHEEP—Importance of in different Views—Nature of in different Kinds—Diſtinguiſhed into different Claſſes or Breeds in different Ways—According to the Nature of their Wool—The Situations in which they are chiefly found—Their particular Properties—Standard Form of in the Ram—Attention neceſſary to this and other Properties in Improvement of—Different Breeds of deſcribed—New Leiceſter or Diſhley Breed—Lincolnſhire Breed—Tees-water Breed—Romney Marſh Breed—Dartmoor Breed—Exmoor Breed—Darſetſhire*

*Breed—Herefordſhire Breed—South Down Breed—Norfolk Breed—Heath Breed—Herdwick Breed—Cheviot Breed—Dunfaced Breed—Shetland Breed—Merino or Spaniſh Breed—Nature and Qualities of each explained—What Breeds moſt ſuitable under different Circumſtances of Soil, Climate, and Situation—With the Intention of Profit from the Carcaſe—From the Wool—Mr. Marſhall's Opinion of different Breeds in reſpect to different Manufactures—Circumſtances to be regarded in Introduction of—Fine Wool may be obtained without Injury to the Mutton—Putting Rams to Ewes—Proper Time for—Proper Selection of Ewes for—Late Duke of Bedford's Practice in—Beſt Age for—Neceſſary Syſtem of Management of Sheep in different Circumſtances—In Winter—Proper Keep while in Lamb—Great Attention to neceſſary at Lambing-time—Neceſſary Proviſion of Food for—Utility of Turnips in this Way—Modes of eating of with moſt Advantage—Lands much improved by—In good Breeds Bran and Oil Cake uſeful—Baiting with Hay neceſſary—Cotting—Great Utility of—Brought through Winter well in this Way—Preſerved Graſs—Vaſt Benefit of for this Uſe in early Spring—Watered Meadows may be depended on where ſufficiently extenſive—Other Means of Support of—Turnip Shoots—Rye-graſs and Clover, Mr. Young's Opinion of theſe—Cabbages better in April—Turnip, Cabbage, Rutabaga—Boorcole—Importance of—Burnet, great Uſe of at this Seaſon—In Summer—Turning upon the Paſtures—What neceſſary in—Beſt Methods of—Attention to the Fly neceſſary—Weaning the Lambs—Beſt Modes of—Proper Feed ſhould be provided for—Ewes to be kept at a diſtance—Advantages of dividing Flocks into different Parcels—Practice of by Mr. Boys—Management in Down and Mountain Sheep—Salving or Smearing—Inutility of the Practice—Profit of Sheep in various Caſes—In Mr. Macro's Eſtimates—In Mr. Ellman's—In the Duke of Grafton's—Folding—Mr. Young's Objections to in certain Caſes—Cauſe of Practice of—Advantage of, in Sheep-yards—On Tillage Lands—Summer Management of Stock Sheep—Beſt Method of waſhing—Proper Time and Method for—Shearing Sheep—Circular Method of an Improvement—Origin of—Introduction of by the Earl of Egremont—Late Duke of Bedford—Mr. Coke—Management in—Expenſes of—Winding the Wool—Frequent Clipping—Effects of—Clothing Sheep—Effects of not fully ſhown—Time of clipping Lambs—Of caſtrating them—Directions reſpecting ſetting Lamb Stock—What neceſſary in the Annual Purchaſe of Sheep where Stock Sheep are not kept—Produce in Wool different in different Breeds—Qualities of adjuſted by Woolſtaplers—Qualities neceſſary for Shepherds—Modes of determining Age of—*Diseases of*—Fly—Foot-rot—Scab—Rubbers—Blindneſs—Rot—Turn or Giddy—Reſp or Red-water—Braxy—Black-water—Skit—Cauſes and Nature of theſe Diſorders—Methods of Cure—Common Salt—Its Uſes in preventing Diſeaſes in Sheep.—HORSES—Utility and Advantages of in different Views—Breeds of, employed in the Buſineſs of Huſbandry—Different Breeds of deſcribed—Blood Horſe too fine—Cleveland Bays—Suffolk Punches—Clydeſdale Horſes—Heavy Blacks—Welch and Scotch Horſes—Properties and Advantages of each explained—Farm-Horſes ſhould be ſelected from the three firſt Kinds—Heavy Kinds leſs uſed, from the Introduction of the Blood Sort—Breeding of can only be attempted under certain Circumſtances—Method of Management in—Time of putting Mares to the Horſe—Importance of having Foals early—Time of going with Foal—Should be well kept during—Care to be taken in working of—Modes of rearing the Foals—Syſtem purſued where Breeding is not practiſed—Time and Method of caſtrating—Practice in Yorkſhire—Mode of breaking of—Making up young Horſes for Sale—Queſtion of the comparative Utility of Horſes and Oxen as Teams—Caſes in which each Kind may be uſeful—Beſt Methods of feeding Teams—Means of leſſening Expenſe of keeping of—Various Eſtimates of—Utility of bruiſing Oats in—Barley may be employed with Advantage in—Feeding Ox-Teams—Working of Teams—What uſeful in—Different Utility of the Stable and Shed Syſtem—Expenſes of keeping Teams differ much—Neceſſary Proportion of Teams to the Extent of Land in different Sorts of Farms—Aſs and Mule Teams—Where uſeful—Diſeaſes of Horſes—Wounds—Bruiſes—Strains—Warble Tumors—Colds—Colics—Staggers—Strangles—Worms—Bots—Farcy—Greaſe—Mange—Deſcriptions and Nature of each—Methods of Cure in—SWINE—Proper Form of—Large Breeds of—Berkſhire—Hampſhire—Shropſhire—Gloucеſterſhire—Herefordſhire—Different Properties of—Large Breeds ſhould be attended to—Small Breeds of—Chineſe—White, Swing-tailed—Different Qualities of—What neceſſary in the breeding of—Utility of convenient Sties—Circular Form of adviſed by Mr. Young—Advantages of—Expenſe of building of—Age of putting to Boar—Produce of—Beſt Seaſons for rearing—Different Sorts ſhould be kept*

ſeparate—Proper Sorts of Food to be provided in Abundance—Crops proper for in this View—Proper Proportions of—Modes of feeding different Sorts of—With Dairy-waſh—Other Sorts of Waſh—Pea Soup—Boiled and other Roots, Cabbages, &c.—More Sows capable of being kept in this Management than under the Dairy Syſtem—Advantages of rearing Pigs only twice in the Year in this Mode—Soiling Hogs more beneficial—Lettuces uſeful for Sows with Pigs—Mode of cultivating them for—Expenſe of Store keeping of various—Beſt Periods of ſelling in this Management—Advantages of breeding and rearing Pigs—Fattening—Seaſons for—Subſtances employed in—Beſt Means of employing them—Advantage of different Sorts of Food in the Production of Pork—Pigs pay for Keep equally well as other Sorts of Stock—Modes of curing Bacon, Pork, and Hams—Diſeaſes of Hogs—Mange—Cracks in Ears—Swellings in Udders—Proper Remedies for——RABBITS—Where kept with Advantage—Proper Breeds of for Warrens—Methods of managing of—Statements of Profit of—Modes of taking by Nets and Traps——POULTRY—Where uſefully kept—FOWLS—Different Breeds of—Proper Conveniences for—Management of in ſetting, breeding, rearing, and fattening of—Expenſes of—Mrs. Boys's Syſtem of Management of—Diſeaſes of—GUINEA Fowl—Uſes of—TURKEY—Breeds of—Proper Management of—Reaſon of Fineneſs of in Norfolk—Living and Dead Weights of——Water Fowl—DUCKS—Kinds of—Beſt Modes of Management of—Utility of in deſtroying Worms, Slugs, &c. on Grain Crops——GEESE—Kinds of—Proper Modes of hatching and rearing of—Manner of plucking of—Methods of fattening of——PIGEONS—Where kept with Advantage—Proper Sorts of—Beſt Management of—Dove-cotes ſhould bekept clean and free from Vermin——BEES—May be kept with Advantage in ſome Caſes—Moſt proper Situations for—Methods of purchaſing Stocks of—Beſt Conſtruction of Hives for—Profits of——FISH-PONDS—Advantageous in ſome Caſes—Methods of conſtructing of—Expenſes of—Manner of ſtocking of in different Caſes—With Carp—Tench, Perch, &c.—Profits of under different Circumſtances.

WHATEVER ſuperiority of attention may formerly have been beſtowed upon other branches of huſbandry, there is ſcarcely any that is of more importance to the farmer, or which of late has undergone more improvement, than that of Live Stock. It was indeed to be expected, that in proportion as the means of its ſupport became better underſtood and more abundantly cultivated, uſeful changes and improvements would take place in the nature, quality and breeds of the different animals that were to be kept, and of courſe a double advantage be obtained by the farmer in the improvement of his land as well as ſtock. There is another circumſtance that has alſo had conſiderable influence in promoting the increaſe and improvement of live ſtock, which is that of the vaſtly increaſed demand for the animals, either in conſequence of their great uſefulneſs in performing different ſorts of labour, or for the purpoſe of human food.

But though much has been effected in different ſituations in bringing different kinds of live ſtock to a higher ſtate of perfection, much ſtill remains to be accompliſhed. It is probably, in general, far from having attained that ſtate to which it is capable of being carried, by thoſe farmers who have the knowledge of combining the beſt and moſt appropriate breeds of cattle and other animals, with their improvements in the cultivation of herbage, or the raiſing of other ſorts of green food for their ſupport. But to enter fully into the nature and explanation of the beſt and

moſt certain modes of effecting ſuch improvements in all ſorts of live ſtock, a much larger collection of facts would ſeem to be neceſſary than has yet been made, as well as a vaſt number of additional experiments. In the preſent ſtate of our knowledge on the ſubject, it is perhaps only poſſible to afford a few hints and directions that may be uſeful in guiding the attention of the farmer.

It has been well remarked, that whenever it is meant to attempt any conſiderable improvement, in the nature of the live ſtock of a farm, care ſhould be previouſly taken that there is a ſufficient degree of ſhelter, ſhade and warmth, as well as a high degree of fertility of the land, and a ſuitable ſtate of drainage, as it is only by the richneſs and abundance of food that ſuch changes can be effected in the moſt advantageous way, or the ſtock be brought to any high degree of perfection*.

In the buſineſs of improving different kinds of live ſtock, two different ſyſtems have been chiefly purſued. The firſt, or that which has prevailed for the greateſt length of time, is by means of croſſing the various breeds, ſo as to ſupply the faults or defects of the one by the merits or perfections of the other: the latter, or that which has been more recently introduced and brought to the attention of the farmer, is by uniting the perfections of the ſame kind, by continuing to breed from the beſt and moſt perfect animals in the ſame line, family or blood.

It was ſuppoſed for a great length of time, and is ſtill by ſome, that the former of theſe methods, beſides its ſuperiority in other reſpects, poſſeſſed conſiderable advantages in preventing the animals from becoming ſmall, tender, and liable to diſeaſe, in conſequence of their being too near akin. This notion has however been ſhown to have little or no foundation in truth, by the great ſucceſs which has attended the contrary method, in the practice of one of the moſt intelligent and expert breeders that this or perhaps any other country has produced†; as his beſt ſtock has been raiſed by the neareſt affinities, not only without either diminiſhing in ſize, becoming leſs hardy, or being more ſubject to diſeaſe; but on the contrary with a continued amelioration and improvement‡. And a ſtill more concluſive proof is, perhaps, afforded in ſuch breeds of cattle as have remained for many centuries in the ſtate of nature, in particular ſituations, without any mixture of others; as in ſuch caſes, though from their unreſtrained condition they muſt, without doubt, have bred in all the different poſſible degrees of affinity; they have been found to continue without any diminution either in their ſize, hardineſs, or health, and without undergoing any injurious alteration in their form, or change in their colour, or other peculia-

* Middleton's Report of Middleſex. † Mr. Bakewell. ‡ Culley on Live Stock.

rities*. But in oppoſition to theſe ſtrong proofs, it is ſtill contended by others, though confeſſedly without any very great experience, that in this method "young ſtock decreaſe rapidly in ſize on the ſame paſture," without any "other ill or good effect taking place in conſequence of it†. It is likewiſe further obſerved, in contradiction of the ſame opinion, that in proportion as an animal decreaſes in ſize, it may be reaſonably ſuppoſed to decreaſe in vigour and activity; but that, how far this may render it capable of feeding or living on leſs food is not aſcertained. There is no doubt, however, it is ſaid, but that very beautiful animals may be produced by breeding in-and-in, as "the young animal comes into the world on a ſmall ſcale; but by keeping it fat from the firſt moment of its exiſtence, it is made to attain a greater ſize than nature intended, and its weight will in conſequence be very great in proportion to the ſize of its bones. But this is far, it is ſuppoſed, from proving that the practice is eligible‡." And it is ſtill further contended in regard to cattle, that, as in this ſyſtem of breeding no expenſe is ſpared in feeding the young ſtock, the breed ſhould of courſe have attained a larger ſize: yet they are not only leſs, but, it is aſſerted, "carry leſs fat on their beſt points than the Herefordſhire cattle," which from the firſt year are kept in a much inferior manner§.

The effects of the ſame method in the dog have been found in ſome degree ſimilar; "the breed has become leſs in ſize, but not leſs keen or active; and by croſſing again with a breed of no larger ſize, it has attained its former weight‖." It is likewiſe added, that "ſome experiments of croſſing the breeds of plants have thoroughly convinced the writer, "that in the vegetable as well as the animal world the offspring of a male and female not related, will poſſeſs more ſtrength and vigour than when they are both of one family¶." It is not however ſuppoſed "that croſſing diſſimilar breeds of cattle has ever a good effect; as the breeds mix without aſſimilating. When the long-horned breed of cattle has been croſſed with the Herefordſhire, ſome of the offspring have followed one breed, and ſome the other, and ſome preſented an awkward mixture of both**."

In this ſtate of the facts, no certain concluſions can therefore be drawn. The ſafeſt plan is, probably, to have recourſe to both methods, according to the nature of the improvement that may be required; and as there is no poſſible means yet diſcovered of rendering accidental varieties, in either the animal or vegetable kingdom, permanent, the beſt way is conſtantly to breed from the beſt and moſt perfect animals of their kind.

* Culley on Live Stock. † Knight in Communications to the Board, Vol. II. ‡ Ibid.
§ Ibid. ‖ Ibid. ¶ Ibid. ** Ibid.

It is indeed obvious, that in the croſſing method of breeding, though it muſt be allowed to be extremely uſeful in many reſpects, the greateſt care and circumſpection ſhould be employed to adapt the animals in the moſt perfect manner to the nature of the improvement which is required; otherwiſe the breed may be in danger of ſuſtaining injury inſtead of advantage. From the vague and random manner, indeed, in which attempts to improve the breeds of live ſtock, on this principle, have in general been conducted, it would ſeem not improbable but that diſadvantage may often have been produced by bringing together ſuch breeds, as, from the great differences in their forms, qualities, and other properties, could have little or no chance of effecting the purpoſe of improvement in any uſeful manner. The agricultural ſurveys of moſt of thoſe diſtricts where breeding or grazing has been carried to any extent, almoſt uniformly complain, that uſeful breeds of live ſtock have been injured and debaſed by the practice of croſſing injudiciouſly conducted. And a late writer, in ſpeaking of ſheep, has well obſerved, "that to the mountebank doctrines of croſſing diſſimilar breeds, which Nature in its infinite wiſdom had ſet aſunder, we are indebted for much confuſion and miſmanagement*." But it muſt notwithſtanding be allowed, that by croſſing, when conducted with ſufficient judgment, improvement may in a great meaſure be effected, eſpecially in what relates to bone or ſize, the hide or coat, the bettering of particular points or parts, and perhaps in what regards the movement or ſpeed of the animal: but in other views it would ſeem incapable of producing thoſe beneficial effects which ſhould conſtantly direct the ſteps of the breeder.

As it is in ſome meaſure a principle founded in phyſiological ſcience, and countenanced by the obſervation and experience of ages, that animals are ſomewhat endowed with the faculty of not only propagating an offſpring that has in a conſiderable degree the properties, diſpoſitions, and reſemblance of themſelves, but that is in ſome meaſure ſubject to a ſimilarity of diſeaſe; it would appear that, although there may be occaſional deviations, the moſt certain method, and that which has the beſt foundation in the nature and economy of the animals, (in ſo far as the particular qualities and other properties, beſides thoſe that have been juſt mentioned, are concerned,) is to breed in the ſame *line*, perhaps in the ſame family†; as, by a careful procedure in this way, the expert breeder may not only have the greateſt ſecurity for attaining that improvement which he is anxious to produce, but run the leaſt riſk of deterioration.

* Lord Somerville's Syſtem of the Board of Agriculture.

† In the technical language of the breeder, this has been termed breeding *in-and in*.

The ſucceſs of the practice has indeed not merely been ſhown in the breeding of the farmer's ſtock, but in that of the ſportſman. It has been found that pointers and game-cocks have been bred with the greateſt perfection and ſuperiority in this mode*. And it is by the ſame means that the valuable properties of the race-horſe are perpetuated and preſerved. The ſame thing likewiſe takes place in the vegetable economy, the fineſt and moſt perfect productions of the ſort being propagated by ſowing ſeed ſelected from the beſt and moſt perfect plants of the ſame kind, and taking the buds or offsets from the beſt and moſt perfect trees of the ſame ſpecies.

There is alſo another circumſtance that ſeems to ſhow the propriety and superior advantage of this method of proceeding in the breeding of domeſtic animals; which is, that however much the breeds of live ſtock may be altered by climate, paſture, and other cauſes, in what reſpects their colour, and other trifling particulars, their ſpecific characters remain invariably the ſame. No cauſes of theſe kinds have ever been capable of changing any one of the diſtinct breeds, whether of neat cattle, ſheep, horſes, or hogs, in ſuch a manner as to have the characteriſtic diſtinctions of thoſe of any of the others. It would therefore appear, that by having recourſe to occaſional croſſing in the above intentions, and the careful ſelection of the moſt perfect animals of the ſame breed or kind, with due attention to conſtant good feeding, the improvement of live ſtock may be carried to the greateſt perfection.

As the principal object of the breeding farmer muſt conſtantly be that of obtaining ſuch animals as will afford him the largeſt profit; it may be neceſſary to aſcertain the nature and form of animal that may be moſt advantageous in this view, or which pays the beſt for the conſumption of its food; as by this means it will be ſeen what points are the moſt deſirable or uſeful in a breed or variety, and what circumſtances ought to be attended to, ſo as to juſtify its introduction in preference to another.

The properties that would ſeem more particularly to deſerve the attention of the farmer, in his different views and ſchemes of improving the breeds of live ſtock, may be conſidered under the different heads of *ſhape*, *ſize*, *diſpoſition*, *hardineſs*, *quick maturity*, *nature of fleſh*, *fattening property*, *milk*, *hide*, *aptitude for labour*, and what may be termed the quality of the breed, or, in the language of the art, *blood*.

In reſpect to the firſt, the ideas or opinions of breeders have differed very materially; but it is obvious, that there can only be one true or perfect form, which

* Culley on Live Stock.

muſt be that which approaches the neareſt to exactneſs in the ſhape and proportion of the different parts. Whenever this is met with, it indicates the true form, and is that which ought to be aimed at by the breeder, whatever the nature or breed of the animal may be.

In this view, a perfectly formed animal ſhould have an exact proportion and conſiſtency in all the different parts; the head neat and compactly formed, but neither too large or of too great a length; the eyes bright and prominent; the neck not of too great length, but ſomewhat thin, gradually narrowing from the breaſt towards the head, to which it ſhould be neatly attached; the cheſt round, wide, full, and of deep girth; the length of the legs well proportioned to the ſize; the fore ones ſtraight and clean, the hind ones forming an angle at the hock, ſo as to ſtand well under the loins; the diſtance between the feet in the different extremities equal; the feet round and even, the hoofs ſtraight; the back and loins ſtraight and broad; the belly firm and capacious; the quarters deep, full, and well fleſhed downwards.

It is, however, difficult to convey any very correct idea of ſhape by words; but that which comes up in ſome meaſure to this ſtandard would ſeem to conſtitute that "utility of form" which has been the great object of modern breeders. And it is probable that ſuch a form is the beſt calculated for the chief object of the farmer, which is that of receiving and ſupporting fleſh in the practice of fattening; as, where animals much exceed or fall ſhort of ſuch correct proportions of parts, there muſt be inconvenience or diſadvantage, either in their being weak and leſs diſpoſed to fatten,—of courſe requiring more food and a greater length of time for accompliſhing the buſineſs,—or in their being deficient in the general weight and value of the meat, from their not fattening ſufficiently on the beſt parts. It has been obſerved to have been the conſtant principle of a moſt intelligent breeder*, to procure ſuch animals, whether of the cattle or ſheep kind, as were capable of weighing the "moſt in the moſt valuable joints," as there is a great difference between an ox of fifty ſtone, carrying thirty in roaſting pieces, and twenty in coarſe boiling ones,—and another carrying thirty in the latter, and twenty in the former†. It muſt undoubtedly be an object of great importance, to have thoſe parts which are of but little value, as ſmall and of as little weight as poſſible. It may alſo be advantageous in particular caſes, to attend to the nature of the conſumption in the ſhape of the animals, in the manner that has been juſt ſeen, as, where ſome parts are

* Mr. Bakewell. † Young's Eaſtern Tour, Vol. I.

more in demand than others, and conſequently ſell at much higher prices, that ſhape which is moſt favourable for this purpoſe ſhould be more attended to.

It is probable, however, that it is on the juſt proportion and ſymmetry of parts in the animals that are employed for the purpoſe of the breeder, that improvement in this as well as other important points muſt depend. And of courſe it ſeems not improbable, but that the excellence of the moſt valuable points in all the different ſorts of ſtock may in ſome degree bear a proportion to the goodneſs of the form in the animals.

That fine fullneſs of ſhape which has been diſtinguiſhed by breeders under the term "beauty of form," has been conſidered as diſtinct from that of "utility of form," and to conſiſt in a more perfect rounding of the parts, and a leſs appearance of bony protuberance. But though it muſt conſtantly be a very deſirable object to bring the ſhape of the animals as near perfection as the difficult nature of the buſineſs will admit, yet utility, or what may in other words be termed profit, muſt be principally conſidered, as being the immediate object of the ſtock-farmer.

In the ſize of animals there is a variety which admirably adapts them to the variations of ſoil, climate, ſituation, and food, as well as the different views and purpoſes of the farmer.

The long agitated queſtion, whether large- or ſmall-ſized animals are the moſt profitable, or pay the grazing farmer the moſt money for the food they conſume, is not yet fully decided; nor is it probably capable of being eaſily aſcertained, on account of the great difficulty of making experiments under an exact ſimilarity of circumſtances, in regard to breed, paſture, food, expoſure, and other points; and what is the difference in the growth, or increaſe of weight, or of labour, between large and ſmall animals, in proportion to the quantity of food which they take for their ſupport. And laſtly, what is the difference in the increaſe and quickneſs of feeding, in ſtock of different ſizes, in relation to the quantity of food which they conſume. A varied ſet of experiments, correctly made with a view to theſe different points, would no doubt lead to many uſeful concluſions, though they would not, probably, finally ſettle the diſpute, on account of the great difficulties that muſt always attend ſuch comparative inveſtigations, from the variation of circumſtances and other cauſes. It would ſeem therefore, that, in the preſent ſtate of our knowledge, no certain directions can be given, in reſpect to the ſize of cattle, that will be generally applicable in governing the conduct of the grazier. The largeneſs

of ſize, though it is a property that may be deſirable, in ſo far as it affords the means of feeding to a great weight; yet, as this is probably acquired by a much larger and longer continued conſumption of food, it is probable that, except in ſituations where food is abundant, the ſmaller-ſized animals may be the more profitable. In deciding the point, it is not merely, as has been ſeen, the difference in the quantity of fleſh that they are ſeparately capable of affording, but the difference of ſuch quantity in relation to the conſumption of food, that is to be conſidered. It was found by Mr. Bakewell, that the "ſmaller the bone, the truer the make of the beaſt," and the quicker in fattening*; which throws the advantage on the ſide of ſmall ſize: and the experience of graziers in general ſeems to favour the ſame concluſion, as they commonly find that the middling and ſmall breed are the moſt profitable, from their fattening with the greateſt expedition. And it has been well remarked, that the Lincolnſhire and Holderneſſe breeds of cattle "are very large, but their ſize lies in their bones: they may be fattened to great loſs to the grazier," but can never "return ſo much for a given quantity of graſs as the ſmall-boned, long-horned kind†."

It may perhaps be objected by ſome, that the difference in the conſumption of food between the large- and ſmall-ſized animals is not ſo conſiderable as is commonly ſuppoſed. But though it muſt be allowed that conſiderable latitude may take place in this reſpect, according to the ſtate of the digeſtive organs and other cauſes, long experience among graziers has ſhown in the moſt deciſive manner, that a number of ſmall-ſized ſtock conſume much leſs food in a given time than large, as in ſome caſes they can ſtock nearly in the proportion of two to one. Mr. Knight, however, inclines to the ſide of large cattle being the moſt profitable, from their not conſuming food in the proportion of their weight; as, on putting the queſtion of the difference in the weight of food conſumed by the largeſt and ſmalleſt in a given time, to different breeders in different parts of the diſtrict where he reſides, he found that they agreed, "that the ſame quantity of food was given to the ſmalleſt and the largeſt beaſt of the ſame age; that the largeſt, even when not maſter of the ſame fold, often kept itſelf in the beſt condition; and that every thing depended on the diſpoſition to fatten, and very little on the ſize of the animal." In his own ſtock he alſo aſſerts the ſame thing to be preciſely the caſe‡. It is however admitted, as juſt ſtated, that a certain quantity of large cattle will moſtly

* Young's Eaſtern Tour, Vol. I. † Ibid.
‡ Communications to the Board of Agriculture, Vol. II.

conſume more than the ſame quantitity of ſmall ones; but not by any means in proportion to their weight.

With regard to any difference that may take place in the quality of the meat from the difference of ſize, it would ſeem to be in favour of the ſmaller breeds; as the fineneſs of the muſcular fibre, or what has been commonly termed the grain of fleſh, has been found to be the moſt delicate in the ſmaller breeds of animals. It is on this account, as well as that of convenience, that the mutton, beef, and other ſorts of meat of ſmall animals are ſo conſtantly preferred by the nice palates of thoſe who indulge in the pleaſures of the table.

In oppoſition to the idea that ſmall animals, when fatted, are in common worth more for any given weight of meat than large ones; it is contended, that if the animal be taken as it ſtands in the paſture or ſtall, the contrary is the truth; but that, when the butcher merely buys what are termed the valuable parts, and receives the offal into the bargain, he will unqueſtionably, for obvious reaſons, "give more for two cows of twelve ſtone each a quarter, than for one of twenty-four." The offal is of much greater value, beſides a conſiderable advantage in the hides*. In ſhort, it is concluded that "the difference between the weight of the animals when living, and of the four quarters when dead, is always in an *inverſe* proportion to their ſize when their forms and merits are equal; but the bones will *then* be in proportion to the *living-weight*, and therefore ſmall animals muſt be in this caſe *moſt diſadvantageous to the conſumer*."

From the greater ſize of the muſcular parts in large animals, the fleſh would, however, ſeem to be more coarſe in the very large breeds, and of courſe be leſs valuable, than in thoſe of the ſmall.

It is alſo ſuppoſed an advantage in the large animals, that the meat when preſerved for future uſe is not only better, from the juices being more fully retained, but from there being leſs waſte, on account of the external ſurface being proportionately leſs.

And it is obſerved, in regard to the opinion that animals of the ſmaller kinds are in general more hardy than thoſe of the large breeds, that if it be meant merely that they are capable of ſubſiſting on ſhorter herbage, it is right; as a large animal, though it may have exactly the ſame form as the ſmall one, neceſſarily requires more time for reſt. It feeds and removes itſelf with greater labour; and notwithſtanding it may be as ſtrong again, as having double the weight, it will ſtill in relation

* Knight in Communications to the Board of Agriculture, Vol. II. ‡ Ibid.

to itſelf be a weaker animal. Its head and neck will be as heavy again, and from their greater length, the weight will recede further from the centre of motion in the ſhoulder; conſequently increaſe in power in proportion to the diſtance: and the ſame thing holds good in reſpect to the whole of the limbs. In the ſtall, or the fold, where large oxen are moſtly fed, theſe diſadvantages are of no conſequence, as the food is received without the trouble of looking for it; and if the neceſſity of a better paſture does not proceed from the larger animal conſuming much more, but from leſs power in collecting food, the conſequence will be, that it muſt "afford the largeſt weight of fleſh with the ſmalleſt conſumption of graſs*."

Small-ſized animals have been aſſerted to be leſs prejudicial in poaching the ground than large ones, on account of their feet being wider in proportion to the weight. It is however obſerved by Mr. Knight, that "the queſtion is, whether the feet and mouths of two ſmall animals will not injure the herbage more than that of one large one." It is remarked that ſmall ſheep do not poach the ground at all; yet it is ſuppoſed that "a ſcore of theſe weighing a ton in the aggregate will do more injury to a rich paſture in forty-eight hours than an ox of the ſame weight in a week." Cows and oxen ſhould, it is ſaid, be kept in the ſtall and the fold when the ground is wet during the winter, and capable of being injured by poaching; and in the ſummer it is not injured by the heavieſt ſtock.

In caſes where the weight of meat is of no material conſequence, as in dairy cattle, the advantage may be on the ſide of ſmall animals, as ſuch cows will give nearly the ſame quantity of milk ſeparately as thoſe of the large kind; and are capable of ſubſiſting on ſhorter herbage, and without injuring the ground in the ſame degree: but where the weight and value of the meat form the principal conſiderations, the largeſt animals the paſtures are calculated to ſupport, are ſuppoſed to be the moſt beneficial to the breeder and the public†.

In the ſmaller-ſized animals, there are, however, advantages in their being capable of being fattened wholly with graſs, without having recourſe to the more expenſive kinds of food, which muſt be the caſe with thoſe of a large kind, and on paſtures of inferior qualities; in their being procured with leſs difficulty, and more adapted to particular ſituations and circumſtances of farmers; and from there being leſs loſs in caſe of accidents taking place‡.

* Knight in Communications to the Board of Agriculture, Vol. II. † Ibid.
‡ Sir John Sinclair in the Farmer's Magazine, Vol III.

On theſe grounds, as there appear ſome things favourable to each ſide, the attention of the breeder ſhould be principally directed by the nature and circumſtances of his paſtures, as well as the command of other ſorts of food which he poſſeſſes; the middle and ſmaller breeds of live ſtock being preferred on the leſs rich and inferior kinds, and the large ſorts in ſuch ſituations as are more rich and fertile, and wherever there is a ſufficient command of food.

It is, without doubt, a matter of much utility and importance to have ſuch breeds of domeſtic animals as are poſſeſſed of tame and gentle diſpoſitions, without being too dull or ſluggiſh in their habits, as ſuch animals are not only leſs diſpoſed to ramble and break the paſtures, but are capable of being reared, fed, and rendered fat, with conſiderably leſs food. In the production of this ſort of diſpoſition much depends upon the modes of rearing the animals. Mr. Bakewell had all his animals, even his bulls, ſo tame and gentle, from early care in this reſpect, that they could be managed with the greateſt eaſe and facility.

Hardineſs of conſtitution is another property in live ſtock that deſerves the attention of the breeder. In expoſed ſituations it is an eſſential and indiſpenſable property; and under all circumſtances it muſt be advantageous for the farmer that a breed is not liable to diſeaſe. Beſides, hardy animals always thrive much better than ſuch as are more tender and delicate in their nature. The circumſtances which have been commonly ſuppoſed to denote this diſpoſition are thoſe of darkneſs of colour and roughneſs of hair. Animals of other colours are however frequently not deficient in this property: and it does not ſeem to depend much upon the colour, but perhaps on the breed, and the manner in which the animal has been reared.

There is another property which is of great conſequence to the breeder, as much of his profits muſt always depend, in a great degree, upon it. This is that of quickneſs in arriving at the ſtate of maturity. With this the abundance of ſupply is likewiſe, in a great meaſure, connected: of courſe it is a property that greatly intereſts the public as well as the farmer, and on both accounts deſerves the particular attention of the breeder. It is probable that ſome ſorts of ſtock, from their labour, or the produce which they afford, may be kept longer with profit by the farmer than others. This has been ſuppoſed to be the caſe with neat cattle, though not with ſheep; but the diſtinction is perhaps not well founded, as the latter obviouſly afford a return in various ways *.

It is evident that the manner in which animals are fed muſt have much influence

* Sir John Sinclair in Farmer's Magazine, Vol. III.

in this reſpect; as when, from the conſtant full ſupplies of food, they are always kept in a thriving condition, they will of courſe arrive much earlier at the ſtate of maturity than under the contrary circumſtances. This will be the caſe, whatever the nature of the ſtock may be. It has been aſſerted that, under this mode, a greater progreſs is made in three years than in the ordinary pinching method of rearing is effected in five*. The neceſſity of not ſuffering animals to be checked or ſtunted in their early growth, by the want of proper care, food, and warmth, is thus fully evinced. This is therefore a point that ſhould never be loſt ſight of by the careful breeder in the raiſing of his live-ſtock.

It is ſcarcely neceſſary, after the obſervations that have been made above, to ſay any thing in addition reſpecting the nature or quality of the fleſh of animals, as it would ſeem to be a property inherent in the muſcular ſubſtance, and probably depending in a great meaſure, if not wholly, on the breed. It is indeed obſerved by Mr. Marſhall, in ſpeaking of the breeding of animals in the Midland diſtricts, where the *fleſh* is "ſpoken of with the ſame familiarity as the hide or the fleece," that the grain is clearly underſtood to depend wholly on the *breed*, and not, as has been heretofore conſidered, on the *ſize* of the animal."

The difference in the flavour of the fleſh of different breeds or varieties of animals would ſeem to depend in a great degree on the nature of the food; while that of colour is probably in a great meaſure fixed and inherent, and the effect of breed: experiments are however wanting on theſe points, in order to place them in a more clear light. The ſuppoſition of its having a relation to that of the colour of the ſkin, is probably without any juſt foundation.

Wherever any very material deviation from the natural colour of fleſh is met with in meat, as has ſometimes been the caſe, it is probably the effect of a morbid condition of the animal. In the living ſtate, the proofs of good fleſh are a mellow, elaſtic, rather firm, feel, without any degree of harſhneſs; and in the dead condition a ſimilarity of feel, with a fine grain and marbly appearance. The difference of age and ſex may likewiſe afford ſome variety in reſpect to the quality of the fleſh, as in old animals it muſt be more firm, and leſs tender and juicy, than in thoſe that are young, as is found by experience. And the fineneſs of the grain is moſtly found much greater in animals of the female than the male kind. Some of the more northern breeds of Scotch cattle are ſaid to excel much in the quality of their fleſh, when killed at a proper age and well fattened.

* Sir John Sinclair in Farmer's Magazine, Vol. III.

There is another property, in ſome degree connected with that juſt mentioned, which is that of the diſpoſition to fatten while young, and in an expeditious manner, when fully fed. This is a property on which the profit of the grazier muſt in a high degree depend, as, where it does not prevail, much of his food muſt be uſeleſsly expended. It cannot therefore, in this view, be too much regarded in the ſelecting of his ſtock. The circumſtances on which it depends have not, perhaps, yet been fully inveſtigated; but it is well known that ſome animals become fat with a very ſmall conſumption of food, while others that eat much larger proportions always remain in a lean ſtate. So far as obſervation has yet gone, this is a property that would ſeem to be in ſome meaſure connected with ſmallneſs of bone. Some think it "probable, however, that a tendency to fatten ariſes from ſome particular circumſtance in the internal ſtructure of the body, of which ſmall bones are in general an indication; and that it is only in this point of view that they ought to be conſidered eſſential; for they often weigh as heavy, and conſequently require as much nouriſhment, as large ones;—ſmall bones, like thoſe of the blood-horſe, being compact and heavy; large bones, like thoſe of the common dray- or cart-horſe, being extremely porous, and conſequently light for their apparent bulk. Indeed, cattle ought not only to be eaſily maintained in point of quantity, but, in remote and uncultivated diſtricts, in regard to the quality alſo of the food they conſume; and it is certain that ſome particular animals will fatten as well on coarſe fare, as others will do on the moſt luxuriant*." The practice of Mr. Bakewell, as well as that of other breeders, would ſeem to demonſtrate that it depends greatly on the form and breed of the animals.

Some have affected to think leſs favourably of the utility of this property or diſpoſition, on account of the largeneſs of the proportion of fat that is ſometimes produced, which is conceived by no means ſo uſeful or economical, in the conſumption as food, as that of the lean part. But where a ſuprabundance or exceſs of fat takes place, it would ſeem to be in a great meaſure the fault of the grazier, and not of the nature or diſpoſition of the breed.

It has been ſuggeſted, that the diſputes in reſpect to the utility or inutility of fattening animals to the great degree that has been lately the cuſtom, muſt of neceſſity proceed from the want of ſufficient diſcrimination; as fat meat, though not ſo fit for common uſe, is in general conſidered as affording more nouriſhment than lean, when

* Sir John Sinclair in Farmer's Magazine, Vol. III.

the ſtate and vigour of the ſtomach are ſuitable for digeſting it; and that although there may, in the common methods of cooking it, be ſome loſs, by proper care and attention there are ways in which this may be almoſt wholly avoided. Thus, it is remarked that "the keelmen of Newcaſtle purchaſe great quantities of fat meat, as they follow the cuſtom, ſo uſual in Scotland, of boiling their meat; the broth of which feeds the family, whilſt they themſelves eat the meat, generally in a cold ſtate, and in great quantities; and are thus enabled to go through the heavy labour they uſually undergo. In many diſtricts, manufacturers and others bake their meat with potatoes under it; and the fat, melted by the fire, falls upon the potatoes, and improves much their taſte, and the nouriſhment to be derived from them. In either of theſe ways, little, if any, of the ſubſtance of the meat is loſt*."

But ſuch ſuppoſitions as the above are probably futile on other principles, as there does not appear to have yet been any other diſcovery made for increaſing the quantity of muſcular ſubſtance, or lean fleſh, than that of cultivating the fattening property of animals. It has long been an obſervation among breeders and graziers, that "good fat makes good lean." The importance of this propenſity is therefore conſiderable, and requires the particular notice of the modern breeder in the raiſing of his live ſtock.

There remains another property that ought to be regarded in the breed of animals, as it in ſome meaſure furniſhes the means of determining the diſpoſition to fatten, by the feel which it affords. This is the ſtate of the hide or ſkin. It is remarked, that "when it feels ſoft and ſilky, it ſtrongly indicates a tendency in the animal to take on meat; and it is evident that a fine and ſoft ſkin muſt be more pliable, and more eaſily ſtretched out to receive any extraordinary quantity of fleſh, than a thick or tough one. At the ſame time, thick hides are of great importance in various manufactures. They are indeed neceſſary in cold countries, where cattle are much expoſed to the inclemency of the ſeaſons; and, in the beſt breeds of Highland cattle, the ſkin is thick in proportion to their ſize, without being ſo tough as to be prejudicial to their capacity of fattening †."

The property of ſupplying in large proportions a uſeful product, ſuch as that of milk, is an object that ſhould not be loſt ſight of by the breeding farmer. The queſtion of the propriety of having a diſtinct breed excluſively for this purpoſe, or that of having it only partly calculated for this uſe, and partly for that of the butcher, has not yet been fully decided: but as it has been found, by long expe-

* Sir John Sinclair in Farmer's Magazine, Vol. III. † Ibid.

rience, that ſuch cows as have much propenſity to fatten, ſeldom anſwer the purpoſe of the dairy, it would ſeem that there ought to be a breed particularly for the pail. It has however been ſuggeſted as probable that, "by great attention, a breed might be reared, the males of which might, in every reſpect, be well calculated for the ſhambles, and the females, when young, produce abundant quantities of good milk, yet, when they reached eight or nine years of age, be eaſily fattened." Such a breed would, it is ſuppoſed, be of the greateſt value of any that could be produced. Some of the beſt Engliſh and Scotch breeds are believed to have nearly attained this point of perfection *.

The fitneſs of animals for the purpoſe of labour is a quality that, in certain circumſtances, may be neceſſary to be conſidered in the breeding of cattle ſtock. The queſtion of the advantage that may be gained in this practice, in regard to the increaſe in the quantity of meat, is far from having been decided; nor has it been well explained whether injury may not be done in reſtricting the growth of the animals by this means, more than can be compenſated by their labour. It is obvious, however, that where cattle are worked, they muſt be longer in being brought to the market. But as, from the greater cheapneſs of rearing and keeping neat cattle than horſes, and various other cauſes, it may be neceſſary to make uſe of cattle for the purpoſe of labour, a breed well calculated in this reſpect muſt be deſirable.

There ſtill remains another property which it is requiſite for the breeder to conſider in the improvement of live ſtock, which is that of *blood*, adopted in analogy to the ſyſtem of breeding in the race-horſe. It is employed to ſignify the natural, fixed, and inherent properties of a breed or kind, as exemplified in their external appearances. Its utility for the purpoſes of the breeder is therefore to enable him to diſcriminate, with greater nicety and correctneſs, in the ſelection of ſuch animals as are the moſt adapted to the improvements he has in view.

These are the main objects to which the breeder ſhould attend, and the means by which he is principally to effect his improvements. The ſucceſs of his endeavours, to whatever ſpecies of excellence his attention may be directed, muſt obviouſly in a great meaſure depend upon the accuracy and correctneſs of his judgment in chooſing thoſe breeds, of whatever ſort of live ſtock they may be, that are moſt adapted to his circumſtances; and in ſelecting ſuch individuals, both male and female, of ſuch breeds, as are the moſt perfect and exact in their different parts and properties; cautiouſly continuing to breed from them, without ever ſuffering the leaſt intermix-

* Sir John Sinclair in Farmer's Magazine, Vol. III.

ture by the admiſſion of thoſe of inferior qualities; advancing in this way with the niceſt attention to ſuch faults or defects, however trifling, as may ariſe, ſo as to alter and correct them by appropriate pairing in the ſucceeding generations. And as an indiſpenſable aſſiſtant in this arduous undertaking, he muſt conſtantly have recourſe to the aid of good and abundant keep at all ſeaſons, with ſuitable degrees of ſhelter and warmth for both the old and young ſtock; ſo that they may never decline in fleſh or be checked in their growth. This would ſeem to conſtitute the great ſecret of the important art of breeding live ſtock, which the ſuperior diſcernment and unwearied perſeverance of a ſingle individual raiſed to a degree of notice and perfection that has had the happieſt effects in bringing the improvement of our domeſtic animals to a ſtate of excellence perhaps unequalled in any other country.

In every ſyſtem of breeding or improving of live ſtock, the greateſt attention is conſequently neceſſary to keep. It has been well obſerved that "all good ſtock muſt be both bred with attention and well fed; and that it is neceſſary that theſe two eſſentials in this ſpecies of improvement ſhould always accompany each other; for, without good reſources for keeping, it would be in vain to attempt ſupporting a capital ſtock, and with ſuch reſources it would be abſurd not to aim at a breed ſomewhat decent in quality*." But improvements of this nature can, in general, only be effected by degrees, as the pecuniary circumſtances of but few farmers admit of a total change. How much ſoever they may diſapprove of what they have in poſſeſſion, they can only object to a few of the inferior: this, however, is in their power; and, by always ſelecting the beſt for breeding and rearing, improvement will in time be effected. Great improvements in cow-ſtock may doubtleſs be made by a proper ſelection of the beſt heifers in carcaſe and milk-bag for breeding ſtock, but more particularly by a judicious choice of the bull. But as prime or firſt-rate ſtock is in but few hands, and the owners generally aſk higher prices than farmers in general can afford to give, it would be highly advantageous in this intention to have proper male ſtock provided by the proprietors of lands†. In this way, the letting of male ſtock in the midland diſtricts has had much influence; and it is probably only by ſome encouragement of this nature that the higheſt improvement in this moſt important department of huſbandry can be attained.

It has been alſo remarked, "that there is one circumſtance relative to the choice or introduction of all new breeds, which muſt not be paſſed over in ſilence, becauſe no farmer can neglect it without certain loſs. Every kind of paſture is fitted to raiſe

* Corrected Agricultural Report of Staffordſhire. † Ibid.

animals to a particular ſize. When beaſts of a larger ſize are brought in, than the quality of the food is calculated to ſupport, theſe animals, whether cows, horſes, or ſheep, or any other kind, will degenerate apace, and never prove uſeful until they come down to that ſtandard or ſize adapted to their ſituation and ſuited to their food. On the other hand, when a ſmaller breed than ordinary is brought in, they continue to increaſe in bulk, until they come up to the pitch which is ſuited to their nouriſhment. But there is this remarkable difference betwixt theſe two progreſſions in reſpect of profit, that in the retrograde progreſs, when animals are brought from rich paſture, and a comfortable ſituation, to the reverſe, they are in every inſtance worſe than the indigenous breed; whereas the animals which are brought from worſe to better, continue to improve till they arrive at that perfection which the change in their ſituation is calculated to produce. Theſe cauſes may not immediately have their full effect, but in a few years they certainly and evidently will. He makes, for this reaſon, a much ſafer experiment who brings cattle from worſe to better, than he who brings them from better to worſe. This reaſoning applies to all plants as well as animals. Highland cattle riſe to a great ſize, not only by the keeping in South Britain, but in rich paſtures at home. In vain will you attempt to improve a breed of animals beyond the circumſtances of the country as to climate and paſture; while, at the ſame time, it is no eaſy matter to diſcern, without proper trials, how far theſe circumſtances can ſupport a better ſtock *." In confirmation of theſe obſervations, and others that have been ſtated above, it has been obſerved that the "richeſt grazing land, and the moſt nouriſhing artificial food, will certainly pay more in feeding large bullocks, ſheep and ſwine, than it would do in feeding the ſmaller ſizes of the ſame ſpecies; and it is equally obvious that the ſmaller breeds will anſwer better on the poor paſture than the large †." Beſides theſe circumſtances, in the introduction of new breeds of live ſtock, there are others that demand attention, ſuch as the particular qualities or properties which the farmer has in view. Theſe muſt be fully conſidered; and ſuch a breed as may beſt anſwer in theſe particular intentions be conſtantly preferred.

In ſpeaking of the vaſt advantages that may be derived from the improvement of live ſtock, it has been obſerved by a late practical writer, that, conſidering the various breeds of domeſtic animals as the machines or vehicles by which farmers are enabled to ſend their herbage and other ſorts of food to the markets, they ought, by the ſtudy of every ſuitable means, to promote their improvement, both in reſpect to

* Corrected Agricultural Report of Perthſhire. † Corrected Report of Middleſex.

form and the diſpoſition to fatten, in order that the produce of their farms may be diſpoſed of in the moſt profitable manner, and that, independent of the benefits the farmers would individually derive by ſuch means, from the breeds being rendered leſs tedious in fattening, and leſs productive in offal, the public would obtain vaſt advantage in the great increaſe of animal food. Indeed, on the ſuppoſition that every individual in England and Scotland conſumes in the proportion of one ſheep in the courſe of the year, and that there are ten millions in the country, it is calculated that, by improving the breeds of that animal only to the extent of one ſhilling, which cannot be deemed impracticable, an additional annual advantage would be gained, in that ſort of live ſtock alone, of five hundred thouſand pounds*. This, on the whole of every kind, would therefore be immenſe †.

After this conciſe view of the principles, properties, and other circumſtances which ſeem moſt particularly to deſerve regard in the improvement of different ſorts of live ſtock, we may examine the nature and qualities of the ſeveral kinds, and the methods of management which are moſt proper and advantageous in each.

Neat Cattle. The breeds and varieties of cattle that are diſperſed over the country are ſo extremely numerous, that no correct enumeration of them has yet been preſented to the public; but a few of the more diſtinguiſhed and valuable ſorts have been well deſcribed by different writers ‡. Almoſt every diſtrict or county has its particular breed or variety of this ſort of ſtock, which, in many caſes, is unqueſ-

* Modern Agriculture, Vol. IV. † Ibid.

‡ It has been uſual to arrange the breeds of cattle, from the nature of their horns, and other circumſtances, ſomewhat in the following manner:

The *Long-horned Breed.*
— *Middle-horned Ditto.*
— *Short-horned Ditto.*
— *Welch Breed.*
— *Suffolk Dun Breed.*
— *Galloway Polled Breed.*
— *Highland or Kyloe Breed.*
— *Lowland or Fifeſhire Breed.*
And to theſe may be added the — *Alderney Breed.* And the
— *Wild Breed.*

The breeds of cattle are alſo frequently diſtinguiſhed by the names of the particular diſtricts, counties, or places where they are the moſt prevalent or the moſt perfect of their kind.

The above method of arrangement has been in ſome meaſure adopted by the writer of a late practical work entitled "Modern Agriculture."

tionably the moſt proper and ſuitable; but in others there is no doubt but that the farmer might be greatly benefited by a judicious change for ſome other ſort more perfectly adapted to his ſituation and circumſtances.

The *long-horned* breed of cattle is diſtinguiſhed, as the name implies, by the great length of the horns, the thickneſs and firmneſs of the texture of their hides, the length and cloſeneſs of their hair, the large ſize of their hoofs, and the coarſe, leathery thickneſs of their necks. They are alſo in common deeper made in their fore-quarters, and lighter in their hind-quarters, than other breeds *. In ſize they are ſaid to be ſuperior to the Suffolk duns, but inferior to the ſhort- and middle-horned breeds †. They are likewiſe narrower in their ſhape, and leſs in point of weight, than the ſhort-horns, though better weighers in proportion to their ſize; and the cows of this breed give conſiderably leſs milk, but ſuch as affords more cream in proportion to the quantity. In colour they are more varied than any of the other breeds; but whatever the colour is, they have generally a white ſtreak along their backs, which the breeders term *finched*, and moſtly a white ſpot on the inſide of the hough. It is contended by ſome that they were the native or original breed of this iſland; but it is not eaſy to aſcertain the matter: it is however conjectured as probable, that "theſe have been the inhabitants of the open plain country; whilſt the wild breed, or perhaps the Welch and Scotch breeds, poſſeſſed the woody, wild, and mountainous parts of the iſland ‡."

Others, however, think it more probable that "the long-horned breed originated in importations of cattle from the neighbouring country of Ireland; and that bulls and cows brought from that iſland, having been coupled with the antient breed of the diſtrict, produced the ſort of cattle known by the name of the Lancaſhire or long-horned," and which now occupy a large portion of the paſture lands of this kingdom §.

Lancaſhire is without doubt the mother diſtrict of this ſort of cattle, but the long-horned breed are alſo the prevailing ſort of ſtock in the counties of Warwick, Leiceſter, Glouceſter, Cheſter, and ſeveral other of the midland counties; and it is ſurpriſing, and ſhows great attention in one inſtance, and equal neglect in the other, that this ſort of cattle are at preſent found in greater perfection in the county of Leiceſter than in the diſtrict whence they take their name ‖. This is ſuppoſed to have ariſen "from the graziers of theſe counties buying their beſt bulls and heifers, for many years paſt, before the people of Lancaſhire were well aware

* Culley on Live Stock. † Ibid. ‡ Modern Agriculture, Vol. III. § Ibid. ‖ Ibid.

of it. The former paid more attention to that kind which were of a true mould or form, and quicker feeders; while the latter contented themſelves with the old-faſhioned, large, big-boned kind, which are not only ſlower feeders, but, when fed, are not ſuch good beef. In ſhort, the little farmers in Lancaſhire, tempted by the high prices given them for their beſt ſtock, had loſt their valuable breed before they were ſenſible of it *."

This breed is commonly underſtood by graziers to be in general rather ſlow feeders, except that particular kind ſelected, improved, and recommended by the late Mr. Bakewell, which are ſaid not only to eat leſs food than the others in proportion to their weight; but to become remarkably fat in a ſhort ſpace of time, and to lay their fat upon the moſt valuable parts, yet to have little tallow in them when killed; and, when uſed in the dairy, to give but little milk. This improved "variety alſo differs, from the reſt of the long-horned cattle, in having very fine, clean, ſmall bones in their legs, and thin hides. They are a middle ſized, clean, ſmall-boned, round-carcaſed, kindly-looking cattle†." They are ſuppoſed to have been raiſed by means of Mr. Webſter's, or what is frequently termed the Canley ſtock. Craven in Yorkſhire is alſo famed for a ſuperior variety of this breed of cattle‡.

The Iriſh cattle are ſuppoſed a mixed breed between the long-horns and the Welch or Scotch, but more inclined to the long-horns, though of leſs weight than thoſe of this country §.

In the *middle-horned* breed of cattle there is probably more variety than in that of the preceding ſort. The Devonſhire variety, when in a ſtate of the greateſt purity, is diſtinguiſhed by a high red colour, without any white ſpots, as the breed is reckoned impure when theſe exiſt, particularly where they run into one another; by having a light dun ring round the eye; by the muzzle being of the ſame colour; by being fine in the bone and clean in the neck; by the horns being of a medium length and bent upwards; by being thin-faced; fine in the chaps, and wide in the hips; with a tolerable barrel, but rather flat on the ſides; by the tail being ſmall, and ſet on very high; by being thin-ſkinned, and ſilky in handling; and by the property of feeding at an early age, or arriving at maturity ſooner than moſt other breeds: they are a ſort of cattle well fitted for draught, both as to hardineſs and quick movement, and their ſhoulder-points are beautifully fitted for the collar ||."

In the Suſſex and Herefordſhire varieties, the colour is alſo deep red, with fine hair; very thin ſkins; necks and heads clean; horns neither long nor ſhort, rather turning

* Culley on Live Stock. † Ibid. ‡ Marſhall's Midland Diſtrict.
§ Culley on Live Stock. || Ibid.

up at the points; well made in the hind quarters; wide acroſs the hips, rumps, and ſurloins; narrow in the chines; tolerably ſtraight in the backs, but the ribs or ſides lying too flat; thin in the thighs; bones not large*. It is obſerved, that "when all the properties which ſhould attach to an uſeful breed of cattle are conſidered, the middle-horned may be ſaid in general to come nearer to perfection than any other in the kingdom. They are of a large ſize, well formed, and, in diſpoſition to fatten, probably much on a par with the ſhort-horned, and greatly ſuperior to the Suffolk. As dairy-cattle, they are alſo as valuable as any that fall under the deſcription of quick feeders; for although they give a leſs quantity of milk than the Suffolk or the long-horned, it is ſaid to be of a richer quality†."

The Herefordſhire as well as North Devon varieties of this breed are indeed a very ſuperior ſort of ſtock both for the purpoſe of labour and that of grazing, as being not only clean, ſtrong, and well made, but affording quick proof under the feeding ſyſtem. Mr. Marſhall likewiſe remarks that the former, with that of the Glouceſter variety, is highly eligible as dairy-ſtock. The females in the Herefordſhire ſort have been found to fatten better than any other kind at three years old; except the ſpayed heifers of Norfolk ‡.

The North Devon variety, from the fineneſs of the grain in the meat, is held in high eſtimation in Smithfield. And they are ſaid to have great ſuperiority over many other breeds, from their poſſeſſing more activity, being better calculated for labour, and having more blood; and which is believed to ariſe from the circumſtance of their being bred from one and two years old bulls and heifers. Great proof in this ſort of cattle is ſhown by the ſize of the rib, the rotundity of the barrel, and the mellowneſs of the ſkin. The colours that are moſt in eſteem, and which denote a ſuperiority in the animals, are thoſe ſhades of the mahogany kind, eſpecially where there is a ſilky or gloſſy appearance in the hide, with a ſlight degree of waving or curling in the hair §. The ox in this variety is moſtly conſidered in perfection about the fifth year of his age.

This valuable breed of cattle is the moſt prevalent in the more ſouthern and ſouth-weſtern parts of this country, as in Suſſex, Dorſetſhire, Hampſhire, Devonſhire, Somerſetſhire, and even ſo far northward as Herefordſhire, where the largeſt, and perhaps the fineſt, variety of this breed of neat cattle is met with. The Suſſex variety, though not ſo large as the Herefordſhire, exceeds thoſe of moſt of the other diſtricts. The oxen in the Herefordſhire ſort, when ſix years old and fattened, will in general

* Culley on Live Stock. † Modern Agriculture, Vol. III. ‡ Rural Economy of Glouceſterſhire. Annals of Agriculture, Vol. XXX.

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weigh from ſixty to one hundred ſtones of fourteen pounds, the fore quarters being moſtly the heavieſt*. From their being ſteady and active, as well as capable of great exertion in harneſs, they are peculiarly adapted to the purpoſes of the team. They may be wrought from three to five or ſix years old before they are fattened.

The *ſhort-horned* breed, as the term ſignifies, is diſtinguiſhed from the others by the ſhortneſs of the horns; by being wider and thicker in the form or mould, and, of courſe, feeding to the greateſt weight; by affording much the largeſt quantity of tallow when fattened; in having very thin hides, and much leſs hair upon them than any other breed except the Alderney; and more particularly by the quantity of milk they give beyond any other breed. The great quantity of milk, thinneſs of their hides, and little hair, are probably the reaſons why they are tenderer than any of the other kinds, except the Alderney. It is perhaps juſtly ſaid of this kind, that they eat more food than any of the other breeds; a circumſtance which cannot be wondered at, when it is conſidered that they excel in thoſe three valuable particulars, viz. in affording the greateſt quantity of beef, tallow, and milk.---Their colours are much varied; but the generality of them are red and white mixed, which, when properly blended, is very pleaſing and agreeable†.

This is a breed chiefly found in Lincolnſhire and the eaſtern parts of Yorkſhire, Durham, Northumberland, and Berwickſhire. In conſequence of its having been originally imported from Holland, it is frequently called the *Dutch*, and ſometimes the *Holderneſs* breed, from a place of that name in Yorkſhire, where it is probable it was firſt eſtabliſhed. As being deſtitute of the exertion and agility of the middle-horned ſort, they are not ſo well adapted for the cart or the plough. And conſidering their ſize, and the quantity of food they devour, it is probable that they are inferior to any of the above-mentioned breeds; and, when compared with the Suffolk duns, very greatly ſo. This breed has been lately much improved in Yorkſhire, where the beſt of the kind are to be met with.

It is remarked that "the long-horns and theſe have met upon the mountains which ſeparate Yorkſhire from Lancaſhire, &c. and, by croſſing, have produced a mixed breed, called *half long-horns*; a very heavy, ſtrong, and not unuſeful kind of cattle‡.

The *Welch* breed of neat cattle, eſpecially that which is found in Cardiganſhire, is moſtly black, with thick horns turned upwards; ſmall in ſize; clean-boned; well-ſhaped, eſpecially where the native breed has not been injured by injudicious croſſing with other ſorts. This breed is hardy and active, and in great requeſt in the

* Culley on Live Stock. † Ibid. ‡ Ibid.

ſouthern counties of the kingdom, on account of the cattle being quick feeders. The quantity of milk which the cows afford is not large; but they are a breed well adapted to the country in which they are found, though capable of great improvement by ſelecting the beſt individuals of the native breed*.

The *Suffolk Dun* breed is a ſort of neat cattle found to prevail in that diſtrict; and which are eaſily diſtinguiſhed by their being polled, of ſmall ſize, and a dun colour. They are moſtly plain in their form. The cows are lean, and large in their bellies. They are valuable for the purpoſe of the dairy, as the cows give large quantities of milk†. The weight of this breed of cattle is moſtly on the average from fifty to ſixty ſtone. The author of the Treatiſe on Live Stock ſeems to think this only a variety of the following breed, produced in conſequence of the great connection between the Scotch drovers and the Suffolk and Norfolk feeders, as both ſorts are in general polled; and though the Suffolk are moſtly light duns, while the others vary greatly in colour, this might take place from ſome partiality to that colour.

The *polled* or *Galloway* breed of cattle is alſo very valuable. In weight and ſize, it is as much leſs than the long-horns as theſe are than the ſhort-horns. The cattle generally weigh from forty to ſixty ſtone, ſome particular ones reach ſeventy and upwards: but their moſt eſſential difference from every other breed of cattle is their having no horns at all: ſome few, indeed, in every other reſpect polls, have two little knobs, from two to four inches long, hanging down looſe from the parts where other cattle's horns grow, joined to the head by a little looſe ſkin and fleſh. In moſt other reſpects theſe cattle reſemble the long-horns both in colour and ſhape,---only they are ſhorter and more compact in their form; which probably makes them weigh leſs. Their hides ſeem to be in a medium ſtate, not ſo thick as the long-horns or ſo thin as the ſhort-horns; but, like the beſt feeding kind of long-horns, they lay their fat upon the moſt valuable parts, and their beef is well marbled or mixed with fat ‡.

The origin of this breed was probably in Galloway, a large diſtrict in the ſouth-weſt of Scotland, where they are moſtly bred upon the moors or hilly country, and grazed upon the lands nearer the ſea until riſing four or five years old, when the graziers and drovers take them up in great numbers to the fairs in Norfolk and Suffolk, previous to the turnip-feeding ſeaſon; whence the greateſt part are again removed in the winter and ſpring, when fat, to ſupply the conſumption of the capital, where they are readily ſold at high prices, few or no cattle ſelling ſo high

* Modern Agriculture. † Suffolk Corrected Report. ‡ Culley on Live Stock.

in Smithfield market, from their cutting up ſo nicely, owing to their laying their fat upon the moſt valuable parts;—a great excellence in all feeding cattle*. They alſo prevail in Dumfrieſhire and Ayrſhire.

The polled cows of this breed are ſaid to be good milkers in proportion to their ſize, the milk being of a rich quality, and yielding much more butter from a given quantity than in the ſhort-horns. The oxen and ſpayed heifers have alſo been aſſerted to anſwer well for draught. They are probably, however, in general, too ſmall for this purpoſe.

But though the cattle of the above diſtrict are moſtly polled, they have ſeveral with horns, which they contend are a baſtard or mongrel breed, produced by croſſing with long-horned bulls from other diſtricts. The polled ones, and of theſe the black or dark brindled ones, are preferred to any other, as they allow them to be the original breed of the country. The breeders in Galloway, however, complain of their old breed being loſt, or at leaſt much worn out.

The *Highland* or *Kyloe* breed of cattle is leſs in proportion to the polled cattle than they are to the long-horns. This breed is alſo covered with a long cloſe coat of hair, like the polls and long-horns; and, like theſe, the beef is fine-grained, well-flavoured, and mixed or marbled, but not ſo handſome on the outſide, when expoſed in the market, not being of ſo bright a colour, and often ſpotted with black, even upon the beſt parts, except when made very fat. When grazed, they feed very readily, their weight in general being from twenty to thirty-five ſtone; ſome particular ones reach to more than forty ſtone. The moſt prevalent colour is black; ſome are brindled or dun; but the breeders there, like thoſei n Galloway, prefer the black ones†.

This hardy breed is in poſſeſſion of all the extenſive mountainous country, the Highlands of Scotland, together with the Weſtern Iſles‡. The Iſle of Skye cattle are the ſmalleſt in ſize, but the moſt perfect in other reſpects of perhaps any of the Kyloe or other ſorts; a circumſtance which is ſuppoſed to depend on its being a pure unmixed breed. The removal of the imperfection of ſize deſerves the attention of the breeder§.

This breed is probably calculated in every reſpect to thrive in a cold, expoſed, mountainous country, and probably better adapted to the cold regions where they are bred than any other kind. They are driven to the ſouthward in great numbers every autumn; many into the weſtern diſtricts of Yorkſhire, but the greateſt part into Norfolk, Suffolk, Eſſex, and other parts of the ſouth, where they are fattened. This

* Culley on Live Stock. † Ibid. ‡ Ibid. § Modern Agriculture, Vol. III.

ſort of cattle is frequently termed *kyloes* in theſe parts of the country; probably from a diſtrict in Ayrſhire called Kyle, where they prevail much.

The *Lowland* or *Fifeſhire* breed of cattle is rarely met with in an unmixed ſtate. "Towards Cumberland the cattle are half long-horns, half polls; on the borders of Northumberland they are mixed with ſhort-horns until you reach Tiviotdale, where they become altogether a ſmall coarſe kind of ſhort-horns, or what the Yorkſhire jobbers call *runts*; except a few pretty good ſhort-horned cattle, bred in that pleaſant and fine country, the Tweedſide*." This ſame kind of runtiſh coarſe breed continues all the way to the Frith of Forth. Croſſing this narrow ſea into Fifeſhire, it might at firſt be imagined that the Fife cattle were a diſtinct breed, from their upright white horns, their being exceedingly light lyred, and thin-thighed: but Mr. Culley is pretty clear that it is only from their being more nearly allied to the kyloe breed, and conſequently having leſs of the coarſe kind of ſhort-horns in them. The cattle all along this coaſt continue to change more and more, growing ſtill leſs, until, upon the edges of the mountains, they become quite of the kyloe kind; but ſtill much inferior to that pure, unmixed, valuable breed of kyloes which occupy the more northern and weſtern Highlands, and the different iſles; but particularly the Iſle of Skye, and that tract of country called Kintail†.

The *Alderney* breed of cattle is very delicate and tender, ſo as to be little attended to by farmers. They are not able to bear well the cold of this iſland, particularly the more northern parts of it. They are in general fine-boned, light red or yellow in colour, and their beef generally yellow or very high coloured, though very fine in the grain, and well-flavoured. They make themſelves very fat; and are not in the leaſt ſubject to lyer, or have black fleſh. Very uſeful cattle have been bred from a croſs between an Alderney cow and a ſhort-horned bull. This is a breed that is moſtly to be met with about the ſeats of the nobility and gentry, upon account of the cows giving exceedingly rich milk‡.

Beſides theſe different ſorts, there is a *wild breed* of cattle, which, as they appear in the breed at Chillingham-Caſtle, in Northumberland, the ſeat of the earl of Tankerville, "are invariably of a cream colour, with black muzzles; the whole of the inſide of the ears, and about one-third of the outſide, from the tips downwards, red; the horns white, with black tips, very fine, and bent upwards: ſome of the bulls have a thin upright mane, about an inch and a half or two inches long. The weight of the oxen of this breed is from 35 to 45 ſtone, and the cows from 25 to

* Culley on Live Stock. † Ibid. ‡ Ibid.

35 ſtone the four quarters, 14lb to the ſtone.—The beef is finely marbled, and of excellent flavour. From the nature of their paſture, and the frequent agitation they are put into by the curioſity of ſtrangers, it is ſcarcely to be expected that they ſhould get very fat; yet the ſix-years old oxen are generally very good beef: whence it may be fairly ſuppoſed that in proper ſituations they would feed well*." They cannot, perhaps from their untameable nature, be of any utility to the farmer, as they are only capable of being retained within walls or very good fences.

It is obvious, from this detail of the various breeds of cattle, that they are not all equally profitable to the breeder, the rearer, the dairyman, the grazier, the butcher, or the conſumer. "Some have a greater diſpoſition to fatten than others. Some, being cleaner boned and better formed, have leſs offal. Some give a greater quantity of milk than others. In a word: ſome of the particular properties for which cattle are eſtimable are more diſcernible in one breed than in another. Whether theſe can be all united in the ſame animal, or whether a breed of cattle poſſeſſing all the requiſite qualifications would be equally ſuitable to all ſituations, are queſtions not eaſy to be determined. In regard to the firſt, it ſeems univerſally agreed, that there are two properties for which cattle are eſteemed valuable, that cannot be united; that is, a diſpoſition to fatten, and a tendency to yield a large quantity of milk. The form of the animal moſt remarkable for the firſt is very different from that of the other: in place of being flat in the ſides, and big in the belly, as all great milkers are, it is high-ſided and light-bellied: in a word, its body is barrel-formed, while that of the other is more fitted to embrace a horſe-collar with the wide ſide downwards. It is not probable, therefore, that the properties of two breeds of cattle, ſo oppoſite in form and general appearance, can ever be united in the ſame animal. If a large quantity of milk, whatever be its quality, is the object, the dairyman muſt content himſelf with ſuch plain ill-looking animals as have been deſcribed. And as the milk of all cows is well known not to be of the ſame quality, it appears highly probable, that in proportion as the cows of the milking tribe exceed thoſe that are more diſpoſed to fatten in quantity, in nearly the ſame proportion will their milk be inferior in quality. If this ſhould prove to be the caſe, the ſuperiority of the quick feeders one would ſuppoſe to be completely eſtabliſhed; as, while cattle of this deſcription are confeſſedly better for the purpoſes of the graziers, the butchers, and the conſumers, they would, if this point were determined in their favour, be alſo more valuable for the dairy. No perſon will think of aſſerting, that a gallon or two of whey or of butter-

* Culley on Live Stock, and Northumberland Corrected Report.

milk extra (for the queſtion comes to that) is a ſufficient reaſon for preferring a breed of plain-looking, ill-formed cattle, to one that, except in this particular, is more valuable in every reſpect. In a word, no perſon, who pretends to a knowledge of the different breeds of cattle, will think of ſupporting an opinion ſo erroneous, as that cattle which are diſpoſed to fatten quickly, and at an early age, that, from the ſuperior excellence of their form, have a ſmall proportion of offal, or what the breeders call non-eſſentials, and that, although they yield not a large quantity of milk, yet make up for that deficiency in the richneſs of its quality,—are not more valuable than thoſe which have nothing to recommend them but the ſingle property of being great milkers*."

Mr. Culley, in comparing the breeds of long- and ſhort-horned cattle, contends that the former excel in the hide, hair, and quality of the beef; the latter in the quantity of beef, tallow, and milk;—and that though each breed has long had, and probably may have, its particular advocates, it is not improbable but that each may have its particular advantages in different ſituations. Thus the thick, firm hide and long cloſe-ſet hair of one kind may be a ſecurity againſt thoſe impetuous winds and heavy rains to which the weſt coaſt of the iſland is ſo ſubject; while the more regular ſeaſons and mild climate upon the eaſt coaſt may be more ſuitable to the conſtitution of the other.

In regard to the former breed exceeding the latter in the quality of the beef, it is only to the particular variety ſelected and improved by Mr. Bakewell that preference is to be given in this view; for, as to the long-horned breed in common, it is ſuppoſed that their beef is rather inferior than ſuperior to that of the generality of the ſhort-horned kind; and there is little doubt, it is imagined, "but a breed of ſhort-horned cattle might be ſelected, equal if not ſuperior to even that very kindly-fleſhed ſort of Mr. Bakewell, provided any able breeder, or body of breeders, would pay as much attention to theſe as he and his neighbours have done to the long-horns. But it has hitherto been the misfortune of the ſhort-horned breeders to purſue the largeſt and biggeſt boned ones for the beſt, without conſidering that thoſe are the beſt that pay the moſt money for a given quantity of food†." Such improvements have lately been made in the breeding of ſhort-horned cattle, that they have now been brought to a conſiderable degree of perfection.

But, notwithſtanding theſe two breeds have hitherto been in poſſeſſion of the beſt part of the iſland; it is ſuggeſted that the Galloway cattle, and even the Scotch or

* Donaldſon's Preſent State of Huſbandry, Vol. III. † Culley on Live Stock.

Kyloes, might be bred with advantage in many ſituations, ſo as to be more profitable than either the ſhort-horns or the long-horns, as being "true quick feeders and kindly fleſhed*."

It is likewiſe conceived that the latter of theſe ſorts is better adapted to cold moory expoſed ſituations than any other breed, and that particular breeds are probably beſt adapted to particular ſituations; on which grounds it is recommended to breeders of cattle to find out which breed is the moſt profitable and beſt ſuited to their ſituations, and to endeavour to improve that breed to the utmoſt, rather than try to unite the particular qualities of two or more diſtinct breeds by croſſing; which is a precarious practice, as it is generally found that "the produce inherit the coarſeneſs of both breeds, and rarely attain the good properties which the pure diſtinct breeds individually poſſeſs†."

In the providing of cow-ſtock, great attention is neceſſary in having them bred from ſuch cows as are known to have produced not only good milk in a large proportion to their ſize, but to have continued it for a great length of time. Well-fed and vigorous bulls ſhould likewiſe be conſtantly employed, as by this means the beſt and moſt healthy ſtock may be raiſed. The method of rearing the calves while young has been already deſcribed‡.

The breeding and rearing of cattle-ſtock is a buſineſs that may be accompliſhed upon moſt farms of any extent, but to the greateſt advantage on thoſe where the quantity of coarſe paſture is the moſt conſiderable, and where at the ſame time there is the means of raiſing large crops of the green vegetable kind for winter uſe, as in ſuch caſes the animals while young are capable of being kept in the beſt manner and at the leaſt expenſe. On very ſmall farms the rearing of young cattle can ſeldom anſwer, as the produce in moſt inſtances may be turned to much more profit in other methods of management. But in whatever ſituations the breeding and rearing of cattle-ſtock is attempted, the young animals ſhould conſtantly be kept in the beſt manner the nature of the farm will admit of. This is of much greater conſequence than is generally allowed in the raiſing of good ſtock. But where young animals are pinched for food at an early period of their growth, or fed with ſuch as is not of a ſufficiently good quality, they never thrive ſo well afterwards, or make ſuch good ſtock. This is a fact that has been frequently noticed in reſpect to ſwine; and it does not ſeem to be leſs eſtabliſhed in regard to other ſorts of ſtock. But, beſides

* Culley on Live Stock. † Ibid.

‡ See Suckling of young Calves, in Section on Cultivation of Graſs Land.

good feeding, cleanlineſs is eſſential in raiſing young ſtock to the greateſt advantage. It has been well obſerved in a late uſeful practical work, that in the winter the yearlings ſhould "be fed with hay and roots, either turnips, carrots, or potatoes; and they ſhould be thoroughly well fed, and kept perfectly clean by means of litter. At this age it is a matter of great conſequence to keep ſuch young cattle as well as poſſible; for the contrary practice will inevitably ſtop their growth, which cannot be recovered by the beſt ſummer food. If hay is not to be had, good ſtraw muſt be ſubſtituted; but then the roots ſhould be given in greater plenty, and with more attention. To ſteers and heifers two years old, the proper food is hay, if cheap; or ſtraw, with baits of turnips, cabbages, &c.*"

Mr. Donaldſon thinks the advantage of green winter food for live ſtock ſo great, that there is no way in which it can be applied with greater benefit than "by giving the young cattle a daily allowance during the firſt two or three winters."

Whenever ſtraw is employed as fodder for young ſtock without the above ſorts of food, if it be not very good, or ſlightly mixed with ſome graſſy material, a little hay ſhould always be blended with it, in order that it may be preſerved in proper condition. It is alſo of conſequence that the animals be ſerved with this ſort of fodder in a regular manner, as, where too much is given at a time, Mr. Marſhall has remarked that they do not thrive ſo well.

There is another circumſtance which is of material importance in the wintering of young ſtock, which is that of keeping them more warm and ſheltered from wet than is uſually the caſe, as by this means they thrive faſter, with a leſs conſumption of food, than in the contrary circumſtances. This may be effected either by tying them up in ſtalls, in houſes for the purpoſe, or by keeping them in good ſheds in well-incloſed yards.

There are ſeveral reaſons for keeping young cattle-ſtock of different ages diſtinct from each other, both in their winter and ſummer keeping. It is obvious that in this mode they feed with leſs interruption and inconvenience to each other. And it is remarked by Mr. Young, "that it is not right to keep yearling calves and two-year-olds together; becauſe, in general, the younger the cattle are, the better they ſhould be fed."

The queſtion of feeding the cattle tied up, or looſe in the yards, in winter, has not been yet decided. Each method has probably advantages. In the firſt the

* Young's Farmer's Calendar.

cattle thrive better than when left at liberty to run about the yards. Mr. Marſhall found that in Yorkſhire, cattle kept tied up and regularly fed with ſtraw in a moderate proportion did better than in the ſouthern parts of the iſland, where left looſe in the midſt of greater plenty. Whether this effect is to be aſcribed to the greater warmth, the reſting better, the breed, or the being fed more regularly and *eating with an appetite*, he cannot determine. Some experiments of Mr. Young's alſo lead to the concluſion, that cattle-ſtock thrive better when tied up. They likewiſe ſhow that the practice of tying up is the only one that can be had recourſe to where ſtraw is not in great plenty, and the quantity of the ſtock very inadequate to its conſumption*.

In the latter method there is the advantage of a larger ſupply of manure, eſpecially where the farmer has the convenience of plenty of litter. Where, however, the farmer has convenience, the former method is probably in general the moſt beneficial. In either mode of management much attention is neceſſary to keeping the ſtock conſtantly ſupplied in an evenly proportioned manner, as in this way there will be great advantage both in the ſaving of food and the condition of the animals.

The moſt proper age at which cattle ſhould be made to become productive is a point of much importance, but which probably requires more experiments than have yet been inſtituted to fully aſcertain it. Much may perhaps depend upon climate, ſituation, and the manner in which they have been reared and kept; as where the ſituation is favourable, and the keep rich and good, they may be employed in this way earlier than where it is more expoſed, and the keep indifferent.

This is ſupported by the obſervation of Mr. Marſhall, that in Yorkſhire while the lands were in the ſtate of commonage, the heifers "were frequently kept from the bull until they were three years old: now, in the ſtate of incloſure and improvment, and at at the preſent high rents, they are frequently ſuffered to take the bull when yearlings, bringing calves at two years old. The arguments for bringing heifers in at two years old are, that they come ſooner to profit; and that farmers cannot afford, at the preſent rate of rents, to let them run unprofitably, until they be three years old. On the other hand, the argument in favour of bringing them in at three years old is, that, not being ſtinted in their growth, they make larger and finer cows than thoſe which are ſuffered to bear calves at a more early age."

The ſuperiority in the profit of theſe different practices has not been yet experimentally determined; but as it can ſcarcely be doubted but that an unfavourable

* Annals of Agriculture, Vol. XVIII.

check muſt be given to the growth of the cows as well as their offspring, by their being made to produce at an early age, before they have attained their full maturity, from their not being able to take in and digeſt a ſufficiency of food for their own increaſing growth, and the perfect ſupport of the young animal; it may be the beſt method to purſue a middle courſe, ſo as to bring them in on the rich lands; where the effect juſt noticed may be the moſt fully counteracted, at two years old, and in other caſes, where the keep is inferior, at three. By this practice the intereſt of the farmer may be beſt promoted in all caſes, and the leaſt injury ſuſtained in his ſtock. But in order to induce heifers to take the bull at ſo early a period, they muſt be conſtantly well kept. When this buſineſs is too long protracted they are more liable to miſs having calves. Therefore, in general, letting the heifers take the bull at two years old may be the moſt proper time.

The cow takes nine months and a few days in moſt caſes to complete the buſineſs of geſtation, and ſeldom produces more than one calf at a time. A cow may produce her young at any ſeaſon of the year; but it is of great conſequence to the farmer to have the cows to calve as early as poſſible in the beginning of the year, while veal and all the products which they afford are dear; and that the calves, when reared, may be got forward in the beſt manner. In ſome diſtricts, farmers think it the moſt advantageous for them to calve when there is a full bite of graſs, eſpecially in the firſt calf, as they are ſuppoſed to be rendered better milkers thereby afterwards, in conſequence of the ſecretion of the milk being more completely eſtabliſhed*.

In all caſes the cow-ſtock, eſpecially that part of it which is in calf, ſhould be as well kept and ſheltered from cold and wet in the winter months as the nature of the farm will admit. By keeping the cows in good condition in this way, they not only calve with greater ſafety, but take the bull again much ſooner, and are more advantageous in their milking. The practice of ſoddering with ſtraw ſhould be as much avoided as poſſible, and the method of management that has been already recommended adhered to as much as can be†. The farmer may indeed take it as a certain rule, that no benefit can be derived from bad keeping in any ſort of breeding animals.

The vigour of the bull will laſt ſeveral years, if not made too free with while he is young, but he is uſually in his moſt perfect ſtate from two or three years old to five or ſix. Theſe animals ſhould be kept in well-incloſed places, and have the

* Sir John Sinclair in Farmer's Magazine, Vol. III.

† See Cow-keeping in Section on the Cultivation of Graſs Land.

cows brought to them. The practice of working them is not in general to be adviſed, as they are apt to become by that means too dull and heavy for leaping. They ſhould always be kept well in this intention. In rearing young bulls they ſhould be conſtantly ſupplied with food in a plentiful manner from the period of their being calved till they are full grown. Mr. Bakewell was ſo convinced of the advantage of plentiful ſupport in theſe caſes, that he is ſaid to have employed two cows in rearing ſome of his beſt ſtock of this kind.

In raiſing oxen, whether for the purpoſe of ſale or work, they ſhould be kept conſtantly in tolerable condition, without ever being ſuffered to become ſtunted in their growth, by either their winter or ſummer keep. When deſigned for the market, they are diſpoſed of at two, three, or four years old when not worked, according to circumſtances. Where the intention is to work them, they ſhould be trained as early as poſſible, and be brought into work at the age of two, or three years at the furtheſt. In Herefordſhire the ſteers are brought into work at three years old, and are worked two years, moſtly in yokes, though harneſs has lately been getting more common. In teams of ſix or eight they plough ſomething leſs than an acre a day*. But in the northern parts of Devonſhire, where the breed is admirably calculated for the purpoſe of labour, the oxen are yoked in at from two to three years old, being worked lightly; and at four years old they are brought into hard work, and from that age to ſix they are capable of performing a full day's labour. They there find, that if an ox is to be raiſed to the largeſt ſize, he muſt be worked; as, when kept till five or ſix years old without working, he will not reach the ſize he would have done if he had been inured to labour. This is the fixed opinion of the beſt informed farmers in that diſtrict†. While under this ſyſtem they ſhould be well ſupported with dry food; ſuch as oats in the ſtraw, bean-meal, good hay, or cut-chaff; and by the uſe of theſe in ſmall proportions, with a few cabbages, turnips, carrots, or potatoes, they may be kept up in perfect condition. It is a practice that can never anſwer to the farmer, to let his working cattle-ſtock get low in condition, as the ſaving is a mere trifle in compariſon to the diſadvantage of bringing them into fleſh afterwards.

The ox moſtly reaches his full growth at ſix, but the largeſt-ſized grow the longeſt. It is unprofitable to keep them longer than ſeven or eight years old.

In this diſtrict four are the uſual number in a team, and occaſionally two in croſs ploughing; and with a double-furrow plough ſix. Four plough an acre a

* Knight in Communications to the Board of Agriculture, Vol. II.

† Annals of Agriculture, Vol. XXX.

day, and fix fully two acres every day for ſix weeks. On arable farms of two hundred acres from eight to twelve oxen are ſufficient; and three horſes and ten oxen, or four horſes and eight oxen, are equal to the labour of one of one hundred and fifty pounds a year, when nearly two-thirds of the land are managed in a convertible method of huſbandry, proper allowances being made for different circumſtances*. The method of managing them there is by means of the yoke and bows, in preference to the collar, as in ſuch mountainous diſtricts the powers of the animals are in this way, or that by the head, more effectually brought into action. Lord Somerville has found this to be the caſe from actual trial, being convinced that the pole and the yoke form the true lever for the ox†. Yoked in this manner, the labour is performed with great expedition and diſpatch by theſe animals. Some adviſe the oxen not to be worked too hard, and in this view think ſix ſhould be employed in a team, four working at a time, and two remaining alternately at reſt. Whatever practice may be purſued in this reſpect, it is extremely neceſſary that the oxen be well ſhod before they are put to the work, as, where this is neglected, they ſoon get lame and uſeleſs. As there is conſiderable trouble and often danger in caſting them, in order to perform this operation, it is better to have a machine contrived ſo as to ſhoe them ſtanding. Uſeful contrivances of this nature have been deſcribed‡.

The continued riſe in the expenſe of horſe-keep ſtrongly ſhows, and at the ſame time enforces, the neceſſity and great benefit of making uſe of oxen in all caſes where they can be employed to advantage.

In the fattening of oxen or other ſorts of neat cattle, various ſyſtems of management are practiſed in different caſes, according to the particular circumſtances and objects the farmer has in view, which have been already explained§.

The age of neat cattle is ſhown by their mouths and horns. When turned two years old, the places of the calf-teeth are ſupplied by two new ones, and in every ſucceeding year two more are added until five, when the mouth is ſaid to be full; but this is not probably the caſe until ſix years old, as the two corner teeth are not fully protruded till that period.

In the horn, the firſt ring or circle does not take place till three years old, after which a freſh one is added every ſucceeding year, as long as the horn continues; but theſe rings are often effaced by the artifices of the jobbers and dealers in cattle, for the purpoſe of deceiving the purchaſers.

* Annals of Agriculture, Vol. XXX. † Ibid. ‡ Ibid. Vol. XXXVI.

§ See Grazing and Stall-feeding in Section on Cultivation of Graſs Land.

CATTLE.

Cattle are ſubject to a variety of diſeaſes, which it is impoſſible to conſider in any full or ſatisfactory manner in a work of this nature; but a few remedies that have been found beneficial in particular caſes may be here mentioned in addition to thoſe already noticed.

In caſes of obſtinate ſcourings, much advantage may be derived from a ſtrong decoction of common chalk, hartſhorn-ſhavings and caſſia, in the proportion of half a pound of the firſt to four ounces of the ſhavings, and one ounce of the caſſia; boiling them in two quarts of water to three pints, the laſt articles being put in towards the cloſe of the operation: to this may be added, when cold, a pint of lime-water and two drams of the tincture of opium. The whole being well mixed in a bottle, two or three good horn-fulls may be given twice or three times in the courſe of the day.

In the *Yellows*, which is a diſeaſe to which cows are very ſubject, advantage has been found from the uſe of ſoap in the quantity of about one ounce, given once or twice a day, diſſolved in a quart of the uſual cordial drench, a little warm, keeping the animal confined, and uſing warm maſhes and warm water occaſionally.

Where there is a diſcharge of *bloody urine*, great relief has been derived from a ſtrong decoction of oak or Peruvian bark, in which a ſmall proportion of alum has been diſſolved; two or more horn-fulls being adminiſtered twice or three times in the day.

The *Foul* is a diſeaſe in the feet of cattle, often proceeding from hard driving from a diſtance. After cleaning the parts, and wholly diſcharging the matter formed in the claws, they ſhould be dreſſed with ſome mild digeſtive application, and be kept perfectly free from dirt, gravel, or other extraneous ſubſtances.

The *Garget* is a diſeaſe frequently affecting the glands of the udder with hard ſwellings. It often ariſes from the cows not being clean milked, and may be removed by anointing the part twice a day with a little ointment compoſed of camphor and blue ointment; half a dram or more of calomel being given in warm beer from a horn for three or more mornings if the diſeaſe be violent.

In freſh wounds, nothing further is neceſſary than keeping the parts clean and well covered from the air, previouſly drawing the ſkin over as much as poſſible.

Sheep.—The great value and importance of this animal in its fleſh, fleece, and other products which it affords, is well known. As there are but few farms on which ſheep cannot be kept with advantage in ſome intention or other, ſuch as for the purpoſes of breeding, grazing, or the fattening of their lambs, it is obvious that they muſt conſtitute an object of the firſt conſequence to the farmer. In many ſituations,

by much the greateſt part, and in others the whole of his profits, depend upon them.

In diſpoſition, the ſheep is naturally tame, quiet, and inoffenſive. It is poſſeſſed of leſs means of defence than moſt other animals, and at the ſame time more timid; which induces it to ſeek the ſociety of the flock. The vale or paſture ſheep are in general much more mild and gentle than thoſe of the mountain or heath kinds. The ſheep continues to increaſe in growth till three years old, when it is in common in the greateſt perfection for the purpoſe of being fattened, but will be ſuitable for this uſe, as well as that of breeding, till five or ſix; but as a quick return is the great object of the grazier, they are moſtly fattened at as early an age as poſſible.

The breeds and varieties of ſheep that are ſcattered over the iſland are extremely numerous; but have been arranged and diſtinguiſhed under different claſſes or breeds, by different farmers, in a variety of methods, as from their having horns or being without them, from the nature of their wool and various other circumſtances*; but whatever may be the principle of diſtinction that is adopted, it is evident that they poſſeſs characteriſtic differences that may ſerve to diſcriminate them into diſtinct original breeds.

As in cattle-ſtock we have already ſeen that there is a certain form and connexion of parts that beſpeak the excellence or perfection of the breed, ſo in the ſheep the ſame is the caſe, and the nearer any breed approaches to it, the more perfect or excellent it may be conſidered. In the ram Mr. Culley has thus deſcribed it: "Head fine and ſmall, noſtrils wide and expanded, eyes prominent,

* It has been remarked by Lord Somerville in his "Syſtem of the Board of Agriculture," that "all the breeds of ſheep in this kingdom may be arranged into two claſſes; thoſe which ſhear the ſhort, or clothing, and thoſe which ſhear the long, or combing wool."

The practical author of the Preſent State of Huſbandry in Great Britain has arranged them under the three following general diviſions:

1ſt. The Mountain breed.
2d. The Short-woolled breed: and
3d. The Long-woolled breed.

The firſt comprehending the ſeveral varieties that occupy the different mountainous and elevated ſituations in Wales, Weſtmoreland, Cumberland, Yorkſhire, the South, Weſt, and North of Scotland, and in the Shetland Iſlands; the Cheviot-hills in the South of Scotland and North of England, and the foreſt and common ſheep of the laſt country.

In the ſecond are included thoſe of Hereford, Dorſet, Suſſex, Norfolk, and ſome parts of Cumberland.

The laſt diviſion embraces all thoſe varieties that are diſperſed over the more rich and fertile parts of England, and which are diſtinguiſhed under the titles of the Durham or Teeswaters, the Lincolnſhires, the old and new Leiceſterſhires, &c.

G. Garrard. del.

Dishley Ewe.

1½ Inch to a foot.

Printed for Richard Phillips, *71 St.ᵉ Paul's Church Yard. Oct.ʳ 23 1804.*

C. Garrard del.

Dishley Ram.

2½ Inch to a foot.

Printed for Richard Phillips, 71, St. Paul's Church Yard. Oct.r 23. 1804.

rather bold or daring, ears thin, collar full from breaſt and ſhoulders, tapering gradually to where the neck and head join, which ſhould be fine and graceful, being free from any coarſe leather hanging down, ſhoulders broad and full, joining ſo eaſy to the collar forward and chine backward, as to leave no hollow in either place, mutton upon arm or fore-thigh quite to knee, legs upright with clean fine bone equally clear from ſuperfluous ſkin and coarſe hairy wool, from the knee and hough downwards, breaſt broad and well forward, to keep fore legs at a proper wideneſs; girth or cheſt full and deep, and inſtead of a hollow behind the ſhoulders, that part by ſome called fore flank quite full; back and loins broad, flat, and ſtraight, from which the ribs muſt riſe with a fine circular arch; belly ſtraight; quarters long and full; mutton quite down to hough, which ſhould neither ſtand in nor out; twiſt or junction of inſide of thighs deep, wide, and full, which, with the broad breaſt, keep the fore-legs open and upright; thin pelt covered with fine bright, ſoft wool." This is the model which, in ſo far as form is concerned, the breeder of this ſort of ſtock is to aim at in the improvement of his ſheep, having proper regard to the ſeveral other properties that have been already mentioned.

The *New Leiceſter* or *Diſhley Breed* is diſtinguiſhed from the other long-woolled breeds by having fine lively eyes, clean heads without horns, ſtraight broad flat backs, round or barrel-ſhaped bodies; fine ſmall bones; thin pelts, and a diſpoſition to make fat at an early age; to which may be added a ſuperiority in the fineneſs of the grain and flavour of the mutton to that of other ſheep of the large long-woolled

But Mr. Culley, in his "Obſervations on Live Stock," diſcriminates them with greater minuteneſs into ſeveral different breeds, in the following manner:

				Weight of fleece.	Prices per lb. 1791.			Wethers per qr.	Years old when killed.
1 Diſhley.	No horns,	White face and legs,	Combing wool,	8 lbs.	£.	0	10	25 lbs.	2
2 Lincoln,	Do.	Do.	Do.	11	0	0	10	25	3
3 Teeswater,	Do.	Do.	Do.	9	0	0	10	30	2
4 Dartmoor,	Do.	Do.	Do.	9	0	0	8	30	2½
5 Exmoor,	Horned,	Do.	Do.	6	0	0	8	16	2½
6 Dorſet,	Do.	Do.	Carding wool,	3½	0	1	2	18	3½
7 Hereford,	No horns,	Do.	Fine do.	2	0	2	9	14	4½
8 South Down,	Do.	Gray faces and legs,	Do.	2½	0	2	0	18	2
9 Norfolk,	Horns,	Black faces and legs,	Do.	2	0	1	5	18	3½
10 Heath,	Do.	Do.	Courſe combing,	3½	0	0	6	15	4½
11 Herdwick,	No horns,	Speckled do.	Carding,	2	0	0	6	10	4½
12 Cheviot,	Do.	White faces and legs,	Do.	3	0	0	11	16	4½
13 Dun-faced,	Do.	Dun faces and legs,	Do.	1½	0	3	0	7	4½
14 Shetland,	Do.	Colours various,	Fine cottony,	1½	0	3	0	8	4½
15 Romney Marſh,	No horns,	White faces and legs,	Combing,	8	0	0	10	25	2½
16 Spaniſh,	Horns,	Do.	Carding,	3½	0	4	0		

kind. The weight per quarter in ewes three or four years old from 18lbs. to 26lbs.; in two year old wethers, from 20lbs. to 30lbs.; the length of wool from ſix to fourteen inches*.

The advantage of this breed is ſuppoſed to conſiſt in its producing a better profit to the farmer, in proportion to the quantity of food conſumed, than moſt others; in being more perfectly formed, and conſequently more diſpoſed to fatten quickly; in containing a much larger proportion of meat on an equal weight of bone; in thriving well on ſuch paſtures as would not ſupport other ſorts of the ſame ſize; in being capable of being kept or fattened in larger proportions to the acre than other breeds of the ſame ſize of carcaſe; in the wool being more valuable, though leſs in quantity; in their being ready for the butcher in the early part of the ſpring inſtead of the autumn, by which there is a conſiderable ſaving in the ſummer's graſs; and in the mutton, from the cloſeneſs of its texture, keeping longer than that of other equal ſized breeds.

The principal objections to this improved breed have been made on the grounds of their fattening too much, and the mutton in conſequence becoming leſs delicate in its flavour than in that of other breeds that require a greater length of time in the proceſs; on the deficiency in the quantity of wool which they produce; and on their not being calculated for the fold. It is, however, unqueſtionably a valuable breed on particular ſorts of paſture that are adapted to it, as is evident from its rapidly making its way into different diſtricts†.

It has been further objected to this breed by ſome, that the ſheep are too ſmall, and that, from the thinneſs of their ſkins or pelts, they may not be ſo capable of bearing cold; but experience does not ſeem to ſupport ſuch concluſions.

The ewes in this breed are uſually put to the ram ſo as to have lambs at two years old, when they moſtly produce two lambs each in the proportion of about one-third of the whole, where they have been kept well; which ſhould always be the caſe. When their forms are good they may be kept for the purpoſe of breeding till three or four years old‡.

The wethers may be killed ſo early as at two years old, with the greateſt profit, as when kept longer they are apt to get unneceſſarily fat.

The *Lincolnſhire Breed* is known by having no horns; white faces; long thin weak carcaſes; thick rough white legs; bones large; pelts thick; ſlow feeding; mutton coarſe-grained; the weight per quarter in ewes from 14lbs. to 20lbs.; in three year old wethers from 20lbs. to 30lbs.; the wool from 10 to 18 inches in length §.

* Culley on Live Stock. † Annals of Agriculture, var. loc. and Lincolnſhire Agricultural Report.
‡ Culley on Live Stock. § Ibid.

This breed, as the name implies, is chiefly prevalent in Lincolnſhire and other rich marſh or grazing lands.

It is however, probably, capable of being kept with advantage, and made fat, only on the richeſt ſorts of grazing paſtures. But in theſe caſes it may be kept with more profit than the above breed to three years old. The weight of mutton which the ſheep afford is great; but the fleſh coarſe, with a large proportion of bone. The chief excellence is in the large quantity of wool which they afford, which pays for their being kept longer than other breeds before they are made fat. In its improved ſtate it is, however, a breed much leſs profitable to the farmer than thoſe that feed quicker, except in the caſe of ſuch rich paſtures as have been mentioned.

In the *Tees-water breed* the legs are longer, finer boned, and ſupport a thicker and more firm and heavy carcaſe than the Lincolnſhire; the ſheep are much wider on the backs and ſides; and afford a fatter and finer grained mutton. The weight per quarter in two-years old wethers is from 25 lbs. to 35 lbs., and in particular inſtances to 55 lbs. or more. The wool is ſhorter and leſs heavy than in the preceding breed*.

This is the largeſt breed of ſheep in the iſland; and is the moſt prevalent in the fine fertile incloſed lands on the borders of the Tees in Yorkſhire.

In this breed, which is probably from the ſame ſtock as the above, more attention has been paid to ſize than wool. It is only calculated for warm incloſed rich paſtures, where they are kept in ſmall lots, and well ſupported with food in ſevere winters. They produce a large weight of mutton; but then from their requiring ſo much longer time and richer keep, and being admitted in ſo much ſmaller proportion on the acre, they are probably not upon the whole ſo profitable, even in ſituations where they can be kept with the moſt chance of ſucceſs, as the ſmaller more quick feeding breeds.

The ewes of this breed are however, in general, very prolific, moſtly bringing two and frequently three lambs each. And in ſome caſes a greater number have been produced†.

Improvements have been made in this breed by croſſing with the new Leiceſters. It is a breed that is however very ſeldom found pure.

This is a ſort of ſheep that has been greatly neglected, but which, if judiciouſly improved by croſſing, it is ſuppoſed would anſwer and pay well in diſtricts proper for its ſupport. It is ſuggeſted by Mr. Parkinſon, in the Corrected Report of the State of Agriculture in the Weſt Riding of Yorkſhire, that an uſeful kind is capable of

* Culley on Live Stock. † Ibid.

being raised by crossing the ewes of this breed with Dishley rams, in the management of an expert breeder. Indeed, by the use of these, and those of the Northumberland kind, the quality of the wool and the mutton has not only been greatly improved, but the quantity of bone and offal much lessened; and, at the same time, the fattening property considerably increased; they becoming fatter at two years old than the others are at three. The wethers of this improved sort generally sell unshorn at two years old, from 45 to 55s. a piece, and weigh from twenty-four to thirty pounds the quarter*.

The *Romney-Marsh breed* of sheep is without horns; white faces and legs; rather long in the legs; good size; body rather long, but well barrel-shaped; bones rather large †. Weight per quarter in fat wethers at two years old, from 22lbs. to 28lbs. Wool fine, long, and of a delicate white colour.

This breed has the quality of arriving at the state of fatness at an early age, as well as that of producing a large fleece of fine long combing wool, which renders it highly valuable. But from the size, and the circumstance of the heaviness of the coat, it is only capable of being kept and fattened on the rich kinds of pasture: in such situations it is, however, an excellent breed.

On the rich marsh lands from Hastings to Rye, the graziers find this breed much more advantageous than the South Down; the marsh wethers fattening more quickly ‡. The wool afforded by this breed of sheep is mostly large in quantity; in marsh fat wethers averaging six pounds, and in breeding ewes five pounds, but not equal in quality to the wool clipped from shearlings §. A proof of the great value of this breed of sheep, as well as of the land on which they are fed, is seen in the manner of stocking, which in *tags* is from four to seven per acre, in fattening wethers from six to eight, in barrens from two to three, and in couples three ||.

The *Dartmore* or *Devonshire Natt breed* is chiefly distinguished by having no horns; white faces and legs, thick necks, backs narrow, and back-bones high; sides good; legs short, and bones large. Weight of ewes on the average about 20lbs. per quarter; in wethers at two years and a half old 30lbs. Length of wool much the same as in the preceding breed. It is a breed which is predominant in some parts of Devonshire, as the name sufficiently indicates ¶.

This breed is said to have received considerable improvement by being crossed with the new Leicesters.

* Corrected Report of North Riding of Yorkshire. † Young's Eastern Tour, Vol. III.
‡ Sussex Report, 4to. § Ibid. || Synopsis of Husbandry. ¶ Culley on LiveStock.

The *Exmoor breed* of ſheep is characterized by having horns, and white faces and legs; by being very delicate in the bone, neck and head; by the form of the carcaſe being indifferent; narrow and flat-ſided. Weight per quarter in wethers at two years and a half old from 15lbs. to 18lbs.; and the weight of wool much leſs than in the preceding breed. This ſmall breed of long-woolled ſheep is principally produced on, or in the neighbourhood of the moor from which it takes its name, which is in the northern extremity of the above county*.

This ſort of ſheep are frequently kept two or three years merely for the annual profit of their fleeces, which often do not exceed more than four pounds in weight. But from their being kept upon very bare and indifferent paſtures while young, they are ſuppoſed by many ſheep farmers to be a very profitable ſort of ſtock†.

The *Dorſetſhire breed* is known by its moſtly having horns, white faces; long ſmall white legs; by the carcaſe being rather long and thin; and by the mutton being fine-grained and of good flavour. Weight per quarter in wethers at three years and a half old from 16lbs. to 20lbs. Wool fine and ſhort‡.

This breed has the peculiar property of producing lambs at any period in the ſeaſon, even ſo early as September and October, ſo as to ſuit the purpoſes of the lamb-ſuckler.

The Wiltſhire ſheep are conſidered by Mr. Culley as a variety of this breed, which have acquired an increaſe in weight. And other varieties of it are met with in ſeveral other diſtricts.

It is a breed that has been found to anſwer well in ſome of the midland diſtricts, and, from its cloſe make, to be equally advantageous with almoſt any other. It is, however, ſuppoſed capable of improvement by being croſſed with rams of a larger ſize§.

The *Herefordſhire breed* of ſheep is known by the want of horns, and having white legs and faces; by being ſmall in ſize; and the wool growing cloſe to the eyes; by the carcaſe being pretty well formed; and by the excellence of the mutton. Weight per quarter from 10lbs. to 18lbs. Wool fine and ſhort‖: the lean poor-fed ſheep producing the fineſt. The true breed of this ſort of ſheep is frequently denominated *Ryelands*.

This breed is found to be remarkably patient of hunger¶; but in its management requires *cotting* in the winter ſeaſon, and being fed with hay or peas-halm. In ſome

* Culley on Live Stock. † Billingſley's Survey of Somerſetſhire. ‡ Ibid.
§ Pitt's Survey of Staffordſhire. ‖ Culley on Live Stock.
¶ Knight in Communications to the Board, Vol. II.

caſes they are indeed houſed all the year round in the night-time. The cots are low covered buildings, proportioned to the extent of the flocks. They are ſaid to fatten the beſt at four years old*. The *Archenfield* or true Herefordſhire breed produces the fineſt wool. And Mr. Knight remarks that the diſpoſition of ſheep to fatten in the north-weſt part of that diſtrict is in proportion to the fineneſs of the wool; but he is not certain of its being ſo in this breed. But it ſeems to him that where the wool is cloſe and fine, there are many advantages; leſs nouriſhment is drawn from the body in its ſupport than in the contrary caſe. The long coarſe-woolled fleece admits the rain more freely, and by dividing on the back lets it down to the ſkin. It alſo takes in a larger weight of water, which muſt more inconvenience the animal already heavily loaded. The fine cloſe fleece of this breed admits the water with difficulty, even when immerſed in it, in waſhing, and is never wet through by rain. On account of the cloſeneſs of the texture, it only lodges on the outſide, and is eaſily removed by the animal ſhaking itſelf. Beſides, a fleece of this kind is much more warm and light. On theſe grounds it is ſuppoſed, that no breed of ſheep in the iſland is capable of ſubſiſting on ſo ſmall a proportion of food.

By croſſing this breed with the Diſhley an uſeful kind of ſheep has been produced, both the wool and carcaſe being increaſed in weight, but much injured in reſpect to fineneſs.

The *South-Down breed* is diſtinguiſhed by having no horns; gray faces and legs; fine bones; long ſmall necks; and by being rather low before, high on the ſhoulder, and light in the fore-quarter; ſides good: loin tolerably broad; back-bone rather high; thigh full; twiſt good; mutton fine in grain and well flavoured. Wool ſhort, very cloſe and fine; in length of ſtaple from two to three inches. Weight per quarter in wethers at two years old 18lbs†. This breed is predominant on the dry chalky downs in Suſſex.

It has been lately much improved both in carcaſe and wool; and for the ſhort leſs fertile paſtures is an excellent ſort. The ſheep are hardy, and diſpoſed to fatten quickly. Mr. Ellman, of Glynd, is in poſſeſſion of a very ſuperior flock of this valuable breed. Where the ewes are full kept, they frequently produce twin lambs, nearly in the proportion of one-third of the whole, which are, when dropped, well woolled. The wethers are capable of being diſpoſed of at an early age, being ſeldom kept longer than two years old, and often fed at eighteen months.

* Culley on Live Stock. † Ibid.

SHEEP.

A South Down Ram.

Published Oct. 1. 1804, by **Richard Phillips**, *71, St. Paul's Church Yard.*

A South Down Ewe.

one foot

Published Oct. 1. 1804. by Richard Phillips, 71, St. Paul's Church Yard.

The ewes are uſually kept till between four and five, and found to anſwer well to the graziers in the neighbourhood, as well as the farmers in Norfolk and the adjoining counties, in the place of home-bred ſheep, as being more expeditious feeders, and equally adapted for the purpoſe of the fold*.

It is a breed of ſheep, which from the compactneſs of their form, and their legs being ſhorter, conſiderably outweigh both the Dorſet and Norfolk breeds in proportion to the ſize of the carcaſe, being heavy in a ſmall compaſs. Their hardineſs is eſtimated according to the darkneſs of the colour in the face and legs; but as there is inconvenience in the produce on this account, from the wool, eſpecially about the head and neck, becoming ſpotted with black, and thereby thrown aſide by the ſtapler, as only of half the full value, a middle degree of colour may be the beſt. As an open country breed, they are ſufficiently gentle and tractable. They are capable of travelling well, and of reſiſting the effects of expoſure to cold. The wool is ſcarcely, if at all, inferior in fineneſs to that of the Herefordſhire kind; as the practice of ſorting, which is common in that diſtrict, is not in uſe on the Downs. The merit of this breed is ſuch as to have induced the ſheep-farmers in various diſtricts to introduce them in preference to the above breeds; and on comparative trials, they have been found to poſſeſs a ſuperiority †.

They have been found to conſume leſs food in proportion to weight than the Norfolks, yet keeping in better order. Young ſheep produce the beſt lambs; the *crones* are of courſe conſtantly ſold at four or five years old; and if it were done earlier it is ſuppoſed it would be more profitable. Theſe ſheep have been brought to a high ſtate of improvement in various reſpects by the attentive exertions of Mr. Ellman and other intelligent ſheep-farmers‡.

On Cannock Heath in Staffordſhire, there is a ſort of ſheep that has much reſemblance to this, and is believed to have originated from the ſame breed. It has lately been much improved in the form, thickneſs and weight of the carcaſe, as well as the fineneſs of the wool, by croſſing with rams of the Herefordſhire breed §.

In the *Norfolk breed* of ſheep the face is black; horns large and ſpiral; carcaſe long, ſmall, weak and thin; narrow chine; large bones; very long black or gray legs; mutton fine-grained and high-flavoured, but does not keep well in hot ſeaſons. Weight per quarter from 16lbs. to 20lbs. Wool ſhort and fine ‖. This breed is chiefly prevalent in Norfolk and Suffolk, where folding is much the

* Agricultural Survey of Suſſex, 4to edition. † Culley on Live Stock.
‡ Annals of Agriculture, Vol. XI. § Corrected Report of Staffordſhire.
‖ Culley on Live Stock.

practice, as they have the property of travelling well. In disposition they are given to be restless.

This sort of sheep, as possessing few valuable properties in addition to that of their standing the fold well, and as requiring much expense in their winter keep, an acre of turnips being the usual allowance for half a dozen besides hay, have lately given way to the preceding breed, which is supposed by some to be hardier, less nice in their food, sooner ready for the fold, and more quiet *.

The circumstances most favourable in this breed of sheep are those of their being the native stock of the district; their bearing the fold better than others in that cold climate; their travelling well to distant markets, their mutton being good and in high estimation in Smithfield; and the produce in wool, though small, of a good quality †. The South Down breed has, however, been found to answer so well in the districts where this sort of sheep is predominant, that some experienced sheep-farmers have introduced them with considerable benefit.

The *Heath breed* of sheep is known by having large spiral horns; black faces and legs; a fierce wild-looking eye; short firm carcase; mutton excellent in grain and flavour. Weight per quarter from 12 lbs. to 16 lbs. Wool open, coarse, and shagged. This is an extremely active and hardy breed, which is first met with in the more north-western parts of Yorkshire, whence it has extended itself over the extensive mountainous tract of country on the borders of the Irish Sea, which stretches from Lancashire to Fort-William in the western Highlands of Scotland. The great objection to it is the coarseness of the fleece ‡. These sheep are very active and hardy, which has rendered their introduction into the high mountainous exposed districts advantageous. They are mostly fattened about the third or fourth year, at which age they are found to answer the best. They afford a very superior sort of mutton.

It is probable, that they might be much improved in their coats by being crossed with some of the larger fine-woolled breeds.

The *Herdwick breed* is distinguished by having no horns; by the face and legs being speckled, the larger the portion of white with fewer black spots, the purer the breed; legs fine, small and clean. Weight per quarter in the ewes from 6 lbs. to 8 lbs.; in the wethers at four years and a half old from 9 lbs. to 12 lbs. Wool short, thick and matted in the fleece §.

This breed is peculiar to the elevated mountainous tract of country at the head

* Annals of Agriculture, Vol. XIX. † Kent's Survey of Norfolk, and Marshall's Rural Economy.
‡ Culley on Live Stock. § Ibid.

of the rivers Eſk and Duddon in Cumberland, where they are let to herds, whence the name. They are ſaid to poſſeſs the property of being extremely hardy in conſtitution.

This ſmall breed is ſo extremely hardy, as to ſupport itſelf on the rocky bare mountains with the trifling ſupport of a little hay in the winter ſeaſon; ſcratching down to the heath during the ſnows.

The ewes, from the nature of the climate, produce their lambs late; but which, when dropped, are well woolled. They are generally kept as long as they produce lambs.

The wether ſtock is moſtly diſpoſed of from the mountains, without being put in the paſtures, at from four to five years old.

The fleece in this breed is finer than in that of the preceding; but coarſer than any of the ſhort-woolled breeds. They ſtand in need of a croſs with ſome of the finer-woolled breeds.

The *Cheviot breed* of ſheep is known by the want of horns; by the face and legs being moſtly white, and the eyes lively and prominent; the body long; little depth inthe breaſt; narrow there and on the chine; clean, fine, ſmall-boned legs and thin pelts. The weight per quarter, when fat, from 12lbs. to 18lbs; wool partly fine and partly coarſe *.

It is ſaid to be a valuable breed of mountain ſheep where the herbage is chiefly of the natural graſs kind †; which is the caſe in the ſituations where they are found the moſt prevalent, and from which they have obtained their name. It has undergone much improvement within theſe few years in reſpect to its form and other qualities.

This breed has been lately introduced into the moſt northern diſtricts; and from its hardineſs, its affording a portion of fine wool, and being quick in fattening, it may anſwer well in ſuch ſituations.

The practice of milking the ewes of this breed for the purpoſe of making cheeſe is found to be prejudicial to the animals, and has of courſe been much left off by the beſt ſheep-farmers.

The *Dun-faced breed* has no horns; the face, as the name implies, is in common of a dun tawny colour; the ſize ſmall; tail ſhort; mutton fine. Weight often only 6lbs. or 7 lbs. the quarter. Wool variouſly ſtreaked and blended with different colours, ſome of which is very fine ‡. Mr. Culley ſuppoſes this to partake of the Spaniſh breed. It is not ſo hardy as the preceding.

The *Shetland breed* is ſmall, and moſtly without horns; but what more particularly diſtinguiſhes it from other breeds is, the uncommon ſmallneſs and ſhortneſs of

* Culley on Live Stock. † Ibid. ‡ Ibid.

the tail. Weight per quarter from 7 lbs. to 10lbs. Wool very fine, and of various colours.

This is a very hardy breed, but too wild in its diſpoſition to be confined in incloſed paſtures.

In the *Merino* or *Spaniſh breed* of ſheep the males have horns, but the females are ſometimes without; white faces and legs; the body not very perfect in ſhape; rather long in the legs; fine in the bone; a degree of throatineſs or production of looſe pendulous ſkin under the neck; and the pelt fine and clear. Weight when tolerably fat per quarter in the rams about 17lbs.; in the ewes 11lbs. Wool very fine*. This breed is aſſerted to be tolerably hardy, and to poſſeſs a diſpoſition to fatten readily †.

Mr. Knight obſerves that the produce of the croſs with this breed and the Archenfield or Herefordſhire ſort are very ugly, and, he is informed, ſubject to the foot-rot.

In theſe breeds of ſheep, we have ſeen that there are evidently differences in their ſizes, forms, fleſh, wool, and other properties, that admirably adapt them for different ſorts of paſtures, ſituations and uſes. The large long-woolled breeds, from their being more ſlow, heavy and tame in their diſpoſitions than moſt other kinds, are in general the moſt proper for the rich incloſed paſture diſtricts: the breeds which poſſeſs greater length in the legs, more activity in walking, and a leſs burthen of wool, are ſuited to the more elevated lands, ſuch as the *downs*, *moors* and *heaths* in different parts of the iſland, where the paſturage is leſs fertile and luxuriant: and the ſmall light-carcaſed, hardy breeds are moſt adapted to the expoſed mountainous ſituations, where the food is more ſparing, and obtained with greater difficulty.

Mr. Marſhall, in the Rural Economy of the Midland Counties, has indeed obſerved, that a very long-woolled breed of ſheep, ſuch as the old Lincolnſhire or Teeswater, is neceſſary for the richeſt ſound graſs lands, and the fineſt worſted manufactures; and another, as the new Leiceſter, for the leſs fertile graſs lands as well as the rich incloſed arable lands, where the practice of folding is not in uſe; for the purpoſe of the coarſer ſorts of worſteds, ſtockings, baize, coarſe cloths, blankets, carpets, and other ſimilar articles: a middle-woolled breed, ſuch as the Wiltſhire, the Norfolk, or the South Down, for the well-toiled arable lands, where the fold is employed, for the making of cloths of the narrow medium kinds: a very fine-woolled breed, ſuch as the Herefordſhire Ryeland, for the purpoſe of the fineſt cloths: and the Shropſhire, or ſome of the more hardy breeds, for the heathy mountainous ſituations.

It is therefore neceſſary, in introducing new breeds of ſheep, for the farmer to

* Lord Somerville's Syſtem of the Board of Agriculture. † Ibid.

attentively conſider the nature and ſituation of his paſture, and cautiouſly avoid employing larger or finer breeds than can be properly ſupported. Upon the proper regulation of this point much of his ſucceſs in the improvement of his ſheep-ſtock will depend. And where the bettering the form or improving the quality of the wool are in contemplation, this is to be particularly regarded, while ſuch improvements are attempted by judicious croſſing with proper breeds for the purpoſe, on the principles that have been already explained.

It ſeems evident from a variety of facts that have been lately preſented to the notice of the farmer*, that wool of the fineſt quality may be produced in this country by means of *Spaniſh ſheep*, and their being judiciouſly croſſed with our own fine-woolled breeds; a circumſtance of the greateſt national importance, as affording a probable means of rendering us independent of the foreign ſupply of this expenſive but indiſpenſable article. Too much attention cannot therefore be beſtowed by the breeding ſheep-farmer in promoting this ſort of improvement wherever the nature of his land will admit of it, which may be the caſe, in moſt ſituations, where the ſhort-woolled breeds of ſheep can be properly kept, or probably on more than one half of the paſture-lands of the kingdom †. There is one inducement to this, which is that of its not interfering with the production of the moſt valuable ſort of mutton, a point to which the ſheep-breeders of this country have till lately been particularly attentive, almoſt without regarding the quality of the wool; as it has been found that the quality of the fleſh in the different diviſions of ſheep inclines to the nature of the wool, the ſhort-woolled ſheep being cloſe in the grain of their fleſh, of courſe heavy in the ſcale, and in the taſte high flavoured; while the polled long-woolled ſort are more open and looſe in this reſpect, larger in ſize, and the mutton more coarſe, and in general leſs ſaleable ‡.

In the management of ſheep different ſyſtems are purſued, according to the nature of the farms on which they are kept, and the methods of huſbandry that are practiſed; but whatever theſe may be, it is a principal object with the beſt ſheep-managers to preſerve them in as good condition as poſſible at all ſeaſons of the year. This is particularly the caſe with the paſture kinds of ſheep. In order to accompliſh it in the beſt manner, it is uſeful to divide them into different parcels in reſpect to their ages and ſorts, as by ſuch means they may be kept with more convenience and advantage than in large flocks together under a mixture of various kinds. In this mode there will be leſs waſte of food, and the animals at

* Lord Somerville's Syſtem of the Board of Agriculture.

† Lord Somerville in Communications to the Board, Vol. II. ‡ Ibid.

the ſame time thrive better, and the paſtures be fed with much more eaſe and facility. The benefit of this management has been fully experienced in many of the northern diſtricts, where they ſeparate the ſheep-ſtock into lambs, yearlings, wethers, and breeding ewes. It is probable, too, that in this practice a much larger proportion of ſtock may not only be kept, but the ſheep be preſerved in a more thriving and healthy ſtate.

It has been the common practice, except in particular inſtances, to leave the ewes for the purpoſe of breeding without any ſelection; but it is obvious, that where good ſheep-ſtock are deſired, much care and attention ſhould be beſtowed in chooſing ſuch as are the moſt perfect, and poſſeſs in the higheſt degree thoſe properties which are wanted, let the breed or variety be what it may; as it is only by adhering to this principle that ſucceſs can be enſured.

This buſineſs ſhould therefore be carefully performed at the time they are turned to the ram, if it has not been done before. And it is equally neceſſary that a ſimilar degree of attention ſhould be paid to the ſelecting of the rams, and the adapting of them to the ewes. It is remarked by Mr. Young, in his Farmer's Calendar, that the late Duke of Bedford, in attending to this point, had every ram with the lambs got by him the preceding year put in diſtinct pens, that he might not only examine them but their progeny, previous to his deciding "what ewes to draw off for him." This method is highly judicious, and deſerving of imitation by the leſs intelligent ſheep-farmer. "Such attention," it is added "united with a careful ſelection of cull lambs, muſt keep a ſtock in a ſtate of progreſſive improvement, proportioned to the accuracy of judgment, eye, and hand of the farmer who practiſes it."

The moſt advantageous and proper age for ewes taking the ram in the different breeds has not been fully ſhown; but from a year to a year and a half old may be ſufficient, according to the forwardneſs of the breed and the goodneſs of the keep.

The uſual time of having the rams admitted is about the beginning of October; except in the Dorſetſhire ewes, where the intention is ſuckling for houſe-lamb, in which caſe it ſhould be much earlier, in order that the lambs may be ſufficiently forward. But, by being kept very well, any of the breeds will take the ram at a much earlier period. Where the rams are young, the number of ewes ſhould ſeldom exceed ſixty for each ram; but in older rams a greater number may be admitted without inconvenience; but letting them have too many ſhould be cautiouſly avoided, as by ſuch means the farmer may ſuſtain great loſs in the number of the lambs.

The ewe goes with lamb about the ſpace of five months, of courſe the common lambing-ſeaſon is March, or the early part of the ſucceeding month; but in many of the more ſouthern diſtricts, where ſheep-huſbandry is carried on to a conſiderable extent, ſome parts of the ewe-ſtock are put to the rams at much earlier periods, ſo as to lamb a month or ſix weeks ſooner; a practice which is attended with much profit and advantage in many ſituations where early graſs-lamb is in great demand. It is uſual for the rams to remain with the ewes for a month or ſix weeks, and in ſome caſes longer, in order to complete the buſineſs of impregnation, which in ſome diſtricts is aſcertained by ſmearing the *fore-bows* of the rams with reddle, ochre, or ſome ſimilar ſubſtance that has the property of marking *.

During the time the ewes are in lamb they ſhould be kept in the paſtures, and as free from diſturbance as poſſible, and be carefully attended to, in order to prevent accidents which are liable to take place at this time, ſuch as thoſe of their being caſt in the furrows without the means of getting up again. In caſe any of the ewes ſhould ſlip their lambs, they ſhould be immediately removed from the flock †. They require, as is the caſe with all other ſorts of live ſtock in ſimilar circumſtances, to be kept as well as the nature of the farm will admit, in order that there may be leſs loſs at lambing-time from the ewes being ſtronger, and the lambs more healthy, and better capable of contending with the ſtate of the ſeaſon at which they may be dropped. Where paſtures or other ſorts of good graſs-lands cannot be reſerved for their ſupport, turnips or other kinds of green food ſhould be provided for the purpoſe, and given them in a ſuitable manner; but where it can be done, it is always better to leave this ſort of food untouched till about the period of lambing, when it ſhould be regularly ſupplied in proportion to the neceſſity there may be. The ewes at this time alſo demand conſiderable care being taken to ſee that they are put upon a dry ſheltered paſture free from diſturbance, and that neither they or their lambs ſuſtain injury from the ſeverity of the ſeaſon. Whenever this is the caſe, they ſhould be carefully removed into a proper degree of warmth and ſhelter until reſtored. It is likewiſe a neceſſary as well as uſeful practice, as they lamb down, to take them and their lambs away from the common ſtock, putting them into a piece of turnips or freſh dry paſture where there is ſhelter when neceſſary, as by this means much fewer lambs will be loſt.

By the proper ſupply of turnips at this period, the milk of the ewes is much increaſed, and the growth of the lambs greatly promoted; which is of much con-

* Synopſis of Huſbandry. † Ibid.

ſequence, as when they are ſtinted at this early period they never turn out ſo well afterwards.

In the uſe of this ſort of food, where the ſoil is not ſufficiently dry to admit the ſheep, it is the beſt practice to draw the turnips and convey them to a ſound firm paſture, in order to have the ewes baited upon them once or twice in the day, according as there may be occaſion, particular care being taken that they are wholly conſumed and no waſte made. The circumſtance of their being eaten quite clean up may ſerve as a rule to the farmer for regulating the daily ſupply that may be requiſite. There can be little doubt but that in this way this ſort of food may be conſumed to the greateſt advantage in reſpect to economy. But there is a better method where the land is perfectly dry, eſpecially where the intention is the manuring it for a grain crop, ſuch as barley, which is that of eating the turnips on the land, by means of portions being hurdled off as wanted after they have been eaten up pretty clean. In this way the farmer has leſs trouble, and the great benefit of having the land well manured; but it is only capable of being practiſed on quite dry ſoils, as in other circumſtances the ſheep do much injury by poaching. Beſides, the food from its being dunged, trampled, and ſtaled upon after being partially conſumed, is in ſome meaſure waſted, and does not go ſo far as in being eaten under the former circumſtances. The chief difference is, however, in the manure in one caſe being left upon the paſture, and in the other upon the arable land, in the latter of which the farmer is ſaved the trouble and expenſe of putting it on previous to the grain being ſown. In either caſe, whatever the land may be, great improvement is effected under ſuch management.*.

It has been obſerved by the ſame writer, that "in ſome parts of the kingdom, the beſt farmers give their ewes and lambs bran and oats, or oil-cake, in troughs while they are feeding on turnips;" but it is remarked that "it muſt be a good breed for ſuch a practice to repay." When the weather is extremely wet or ſtormy, or there is much ſnow upon the ground, the ewes and lambs ſhould have hay given them in baits as may be neceſſary. This is beſt done in covered moveable racks, a portion being given freſh every day†. If ſhelter can be provided with convenience, it will always be of much benefit to the ſheep. The practice of letting them to the hay-ſtacks, which is common with ſome farmers, is ſlovenly and waſteful, and which, though it may afford a degree of ſhelter, ſhould never be attempted where the other methods can be had recourſe to. It has been

* Young's Farmer's Calendar. † Ibid.

ſuggeſted as an excellent method, though not eſſentially neceſſary, to allow the ſheep, whether the weather be bad or not, a ſmall proportion of hay daily while at turnips*. By this careful management and the uſe of ſtubble turnips when neceſſary, the ewe and lamb-ſtock may be well ſupported through the ſeverity of the winter, and be brought on in the beſt poſſible condition until the turnips are finiſhed in March, which ſhould always be the caſe, when the preſerved graſs or rouen may be ready to receive them, which is conſidered by ſome as the moſt to be depended upon through this and the following month, which with the firſt week in May is the moſt difficult period of the year to the ſtock-farmer. On dry meadows and paſtures it is invaluable in this view, though at firſt ſight it may have an unpromiſing appearance from the covering of decayed autumnal graſs that is upon it, but which when removed preſents a new growth of freſh green graſs, five or ſix inches in height, brought up by the ſhelter and warmth afforded by the covering of old graſs. This is found to agree remarkably well with the ſheep, as they conſume both together, having, as it were, both hay and graſs in the ſame bite†. It is ſuppoſed by the ſame correct agriculturist, to be impoſſible "to keep a full ſtock of ſheep ſo cheaply in April by any other method as by this. Tolerable rouen will carry ten ewes an acre with their lambs through the whole month. Such rouen may be worth in autumn ten or twelve ſhillings an acre; in April it is worth thirty or forty ſhillings; and if it be a backward ſeaſon, a farmer that has it would not be tempted to ſell it for much more‡." But in the ſupport of his ſheep and lamb-ſtock, if the farmer be provided with a ſufficient extent of watered meadow, he may fully depend upon that without any other proviſion for this period.

But in caſes where theſe cannot be depended on for the ſupport of the ſheep-ſtock at this difficult ſeaſon, the improved practice is, inſtead of depending on turnips and hay with rye ſown for the purpoſe, the young wheats and the run of the paſtures, to let the turnips continue ſo as that their ſhoots may become an object of ſheep-food, and to have annually a portion of tolerable good land ſufficient to the extent of the flock, under rye-graſs and clover, ſo as to be ready in the ſpring to take the ſheep from turnips, and ſupport them till the period of turning upon the paſtures. It is remarked that "this conduct is an improvement on the other, as it gets rid of three great evils: depending on rye, which is ſoon eaten; feeding on wheat, which is pernicious to the crop; and turning too ſoon into the general paſtures. But at the ſame time that it effects this advantage, it is open to ſome

* Young's Farmer's Calendar. † Ibid. ‡ Ibid.

objections, which make further improvement neceſſary. Keeping the turnips long in the ſpring is very bad huſbandry. It damages greatly the barley crop, both in robbing the land, and preventing it from being ſown in proper time: nor is the food of great conſequence; for many acres of turnip-tops are requiſite, the number of which muſt be in proportion to the ſtock of ſheep; and as to the roots, they grow ſo ſticky and hard after the tops are at all advanced, that their value is trifling. With reſpect to ray graſs, the clover mixed with it is ſeldom above three inches high at this ſeaſon; and a great breadth of ground to a given ſtock muſt be aſſigned to keep the ſheep through April. The number of acres of that young growth neceſſary to keep a hundred ſheep and lambs is ſurpriſing; ſo that theſe farmers, although they manage to ſpring-feed more ſheep than the worſt of their brethren, yet effect it at a great expenſe, and at laſt not in any degree comparable to what might be done. A turnip ſhould never be ſeen on the ground after March. For the month of April the farmer ſhould have a field of cabbages ready, which, yielding a great produce on a ſmall breadth of ground, reduces the evil of a late ſpring ſowing; and, if he manages as he ought, totally excludes it. The turnip-cabbage, and ruta baga, will laſt as long as wanted; and, though it runs to ſeed, yet the bulb will not be ſticky. The green boorcole may be ſed off ſeveral times. It is impenetrable to froſt, and will make ſhoots in the winter."

"Another crop for feeding ſheep in ſpring, which is of particular merit, is burnet. An acre of it managed properly, will at this ſeaſon yield much more food than an acre of clover and ray-graſs. It ſhould be four or five inches high in November, and left ſo through the winter. Burnet has the ſingular quality of maintaining its green leaves through the winter; ſo that, under deep ſnows, you find ſome luxuriance of vegetation. From November to February the crop will gain two or three inches in growth in the young leaves, and then be ready for ſheep. It will be better in March, and, if kept, ready in April, not only for ſheep, but horſes, cows, or any other ſtock*."

By theſe means, the ſheep and lambs may be continued in good and healthy condition, which is of great conſequence to the ſtock, till the time of turning upon the paſtures, when they ſhould be ſeparated, where the farms are incloſed into ſuitable diviſions, in proportion to the quantity that each paſture which they are to occupy can ſupport, care being taken not to over-ſtock the fields, though hard ſtocking in ſome caſes may be uſeful †. By ſome managers they are put upon the

* Young's Farmer's Calendar. † See Stocking of Paſtures.

beſt paſtures of the farm, while others let them have thoſe of the inferior kinds. Each method may have its advantage under different circumſtances; but the main object, that of having the ſtock preſerved in good condition, is never to be loſt ſight of. In keeping ſheep on incloſed paſtures, particularly where the lands are much occupied with wood, conſtant care is neceſſary in order to guard againſt the miſchief of the fly, as its effects are often irremediable in the courſe of a very ſhort time in ſuch ſituations, if not attended to, in hot ſeaſons.

The weaning of the lambs is a buſineſs that ſhould be attended to ſome time in the courſe of July, but it is accompliſhed more early in ſome diſtricts than others. In order to effect this in the beſt and moſt advantageous manner, a proper reſerve of ſome freſh paſture graſs where there may be a good bite for the lambs to feed upon ſhould be made. It is of much conſequence that an ample proviſion of this nature be had, in order that the growth of this young ſtock may not ſuffer any check on being taken from the mother. Some adviſe clover in bloſſom as the moſt forcing ſort of food in this intention. And ſaintfoin rouen is highly valuable for the ſame purpoſe. The ewes ſhould be removed to ſuch diſtant paſtures or other places as that they cannot be heard by the lambs, and thereby cauſe them to be diſturbed in their feeding. And where the ewes ſuſtain any inconvenience from their milk, it ſhould be drawn once or twice, as by this means diſeaſe may be prevented*. After the lambs have been removed, the ewes are returned to the ſituations deſtined for their ſummer ſupport.

As it is neceſſary in the common management of ſheep-ſtocks to remove a certain number of the crones or old ewes annually, and replace them by the beſt lambs, in order to keep them up in the greateſt perfection, it is of conſiderable importance to have the buſineſs performed in a proper manner. In moſt of the ſheep-diſtricts in the ſouthern parts of the kingdom, this ſelection or ſetting of lamb-ſtock is uſually made about the month of Auguſt, when the fairs for the ſale of lambs moſtly take place. And as the whole are then collected for drawing into different lots, it may be a very ſuitable period for ſelecting thoſe that are to ſupply

* It is obſerved in the Northumberland Report, that "when this practice, as was uſual, is continued to eight or ten weeks, it becomes very detrimental, keeps the ewes lean, and ill prepared for meeting the ſeverities of winter.

"This cuſtom has been long diſuſed by the intelligent farmers in the lower diſtricts; and much laid aſide by the moſt conſiderable hill farmers. The profit of milking ewes for ſix or eight weeks is eſtimated at 8d. per ewe; and it is generally agreed they are decreaſed in value at leaſt 1s. 6d. per head; of courſe there is a loſs of about 1s. per head by milking. In one inſtance of milking long-woolled ewes there was a loſs of at leaſt 3s. per head."

ſuch deficiencies in the breeding ſtocks. It is obſerved by Mr. Young in his excellent Calendar of Huſbandry, that "in making this ſelection the farmer or his ſhepherd uſually (whatever the breed may be) rejects all that manifeſt any departure from certain ſigns of the true breed: thus, in a Norfolk flock, a white leg, and a face not of a hue ſufficiently dark, would be excluded, however well formed; in the ſame manner a white face on the South Downs; in Wiltſhire a black face would be an excluſion, or a horn that does not fall back; in Dorſetſhire a horn that does not project, &c. &c. And where the produce is annually ſold lean, there is reaſon in all this; for cuſtomers who have been uſed to, and prefer certain breeds, as having paid them well, are apt to be faſtidious when they purchaſe. Some farmers in this ſelection look chiefly at ſize, always keeping the largeſt frames; but this is probably erroneous, unleſs they *keep* very high. It connects with a queſtion by no means aſcertained, whether ſheep do or do not eat a quantity of food proportioned to their weight? In general, it is a ſafer rule to chooſe a well-formed lamb, or that indicates the probability of making a well-formed ewe, rather than to ſelect for ſize. The attention that is to be paid to wool, in the breeds that produce the carding ſort, will depend on the price to be received: if the farmer lives in a diſtrict where the price of the year is given equally to all flocks, there is little encouragement to leſſen quantity for the ſake of quality; retaining, however, in idea, the fact that both are attainable, that it is very common to ſee coarſe *breeched* ſheep with light fleeces, and thoſe of a fine quality heavy in weight. The Spaniſh fleeces, which are finer than any other, are heavier than thoſe of our fineſt-woolled ſheep. With combing wool the importance of the fleece depends ſtill more on price; we have ſeen it at 8s. a tod; and it has lately been 36s. Quality is of very little conſequence indeed, compared with quantity; and when wool ſells high, no prudent breeder will ſet his ſtock without being governed conſiderably by this object.

"The high prices at which new Leiceſter and new South Down rams let and ſell has opened a field of ſpeculation in ſheep-breeding. It is ſufficient to remark, that this ſpirit of breeding, whether it ſhall prove durable or not, whether much money ſhall or ſhall not be made in it in future, is not what any prudent man beginning buſineſs will adventure in but with great caution: men of ſuch immenſe fortune are now taking a lead in it, and are in many reſpects doing it on ſuch liberal principles, that the wiſeſt conduct of ſuch farmers as he may be ſuppoſed to addreſs, is to take proper opportunities of converting their experiments to their own (the

ſarmers) profit. Leave the expenſe to them; but, when you can, convert the profit to your own advantage. In ſetting a ſtock of lambs, therefore, you may mark a ſcore of the beſt, for a future ram to be picked up when opportunity offers; or, better ſtill, to ſend to the tup of ſome ram-letter that takes them in at a reaſonable price per head. By every year ſelecting five or ſix per cent. and by every year covering that number by a ram better than any of your own, the flock muſt be on the improving hand; and this may be done at a very ſmall expenſe."

And as this is not only the proper period of filling up the deficiencies in the ewe-ſtock, but alſo for increaſing or diminiſhing the quantity of ſtock, by reſerving a larger or ſmaller number than that of the old ſheep which are diſpoſed of, it is a matter that demands particular attention. The following uſeful directions are given in the ſame intelligent work: "On a farm with a given ſtationary ſheep-walk, it is probably regulated by circumſtances that rarely change; but, on incloſed farms, where the ſheep are ſupported by fields alternately in graſs and tillage, variations may eaſily be ſuppoſed, and the queſtion of hard or light ſtocking, that is, of cloſe feeding or a head of graſs, then comes in to decide the number kept. If the produce or profit per head is looked to, the conduct to be purſued is evidently to ſtock lightly; but if the return is looked for in corn from fields laid down for refreſhment by reſt, then cloſe feeding is a very material point, and the number kept will depend on it. With all the graſſes, &c. that do not decline from age, the more ſheep you keep the more you may keep, and the more corn you will reap when ſuch are ploughed; a circumſtance too important to be forgotten. But the young farmer will remember, that upon this ſyſtem he muſt not have a *ſhow* flock, or let the vanity of a farm have the leaſt influence with him: if in this way he will have ſomething to talk of, a ſcore or two of pampered favourites, the fewer the better, for they may coſt him more than they are worth."

After this buſineſs has been properly executed, the ewe- and wether-lambs which remain are uſually ſent to the neighbouring lamb-fairs to be diſpoſed of. But where the fairs for this purpoſe happen later than this period, as in the beginning or latter end of September, as is the caſe in ſome places, Mr. Young adviſes that "great care be taken to keep them in forcing food, as in ſpring-tares, early-ſown rape, good graſs of the right degree of bite, &c. &c. in order to promote their growth and increaſe their value; but to ſell in Auguſt is more beneficial."

In the down- and mountain-ſheep there is ſome difference in the management from that of thoſe on the incloſed lands, though the ſame attention in the ſelecting

and chooſing of the breeding- and ram-ſtock is now moſtly practiſed with the better and more enlightened ſheep-farmers in ſuch diſtricts.

In the former ſituations they are perfectly aware that, beſides the improvement of their tillage lands, their ſheep can be rendered of conſiderably more value; a circumſtance which has had the happieſt effects in promoting improvements in this department of huſbandry. The chief difference in the method of keeping them, is in their being turned upon the downs, heaths, or commons, as early as poſſible in the ſpring ſeaſon, as about the middle of April, and kept there till the beginning of autumn, as in October; the ſhort ſweet nutritious herbage in theſe ſituations affording them a ſupply of food ſufficient to keep them in tolerable order. But when this keep begins to decline the farmers have recourſe to other ſorts of food, the ſheep being uſually folded on turnips or cole, on which they are continued during the winter until they are expended, when they are chiefly fed with hay, ſtacked for the purpoſe on the downs or other places, till there is again a ſufficient bite of graſs. In theſe caſes the practice of folding is moſtly in uſe throughout the year; which during the ſummer and autumn is moſtly on the lands under preparation for wheat-crops, but in the winter occaſionally on the ſtubbles, though more generally on the downs and paſture; and in the ſpring on the grounds that are deſtined for the barley crops*.

In ſome of the more elevated and hilly diſtricts in the northern parts of England, where ſheep-huſbandry is conducted on an extenſive ſcale, the ſheep on being divided, under the care of different ſhepherds, into old ſheep, ſuch as wethers and two-year olds, and breeding and young ſheep, the former are put upon the more elevated and expoſed paſtures, and the latter on thoſe that are more fertile and ſheltered, being well ſupported in the winter with turnips and hay†.

There is another inferior ſort of management in theſe ſituations, which is that of permitting the flocks to range over the hills and commons during the ſummer ſeaſon, moſtly without being under the command of any ſhepherd. About the cloſe of this ſeaſon, or on the approach of winter, they are collected together, and brought home in order to undergo the operation of *ſmearing* or *ſalving*‡, which is common in theſe diſtricts, though it does not prevail, we believe, in the ſheep-huſbandry of any

* Donaldſon's Preſent State of Huſbandry in Great Britain. † Ibid.

‡ This is an operation that was formerly conſidered as indiſpenſable to the health and ſafety of ſheep. But in the ſouthern parts of the kingdom, according to the Survey of Northumberland, it is not in uſe, and in ſome of the leſs expoſed northern diſtricts it is wholly in diſuſe; even with ſome of the hill-ſheep farmers it is now laid aſide without any inconvenience being ſuſtained.

of the more ſouthern parts of the iſland. After this work has been performed the old ſtock-ſheep are returned to their former ſituation, and, in ſome caſes, the hogs and other young ſheep with them. But in other caſes a better management is purſued; in ſome inſtances, where the nature of the farms will admit of it, theſe laſt ſorts being wintered in the incloſed paſture grounds that are near to the houſes: and in other places, what are termed the home-grounds, whether open or incloſed, are purpoſely preſerved or ſaved during the ſummer ſeaſon, in order to admit the whole ſtock to be ſupported on them in the winter. When theſe are not ſufficient for this uſe, others at a diſtance are frequently provided. In ſevere ſeaſons, ſome hay or ſtraw is likewiſe given daily *.

In the ſheep-diſtricts in the moſt northern parts of the kingdom a ſtill leſs eligible management is in uſe: the flocks are in common left to provide for themſelves, even in the moſt ſevere and inclement ſeaſons, when the bleak tracts on which they live are covered deeply with ſnow. In theſe caſes the ſheep have their chief dependence for ſubſiſtence on their own habits, which lead them to remove the ſnow by their feet with great facility till they reach the heath or withered herbage.

The ſubſtance employed in this diſtrict is a mixture of 12lbs. of butter with four quarts of tar, well incorporated by being put together while warm. This quantity is ſufficient for twenty-four ſheep. In Perthſhire in the north of Scotland "the compoſition now in uſe is likewiſe tar and butter. Some take ten Scotch pints of tar to a ſtone of butter; others only five pints of tar to that weight; and others in the various proportions between theſe extremes. This quantity ſufficeth for laying fifty-five or ſixty ſheep, at the rate of three or four pence each, according as there is more or leſs tar in the mixture. Formerly ſhepherds uſed tobacco-juice and ſoap, and in ſome caſes chamberley; but theſe are laid aſide as leſs efficacious."

The buſineſs is in ſome places done in November. In Perthſhire, the ſtore-maſters ſmear their lambs about the beginning of October; and if the weather be favourable, they continue the work, without intermiſſion, till all the ſheep, they intend, be ſmeared. In ſome places they ſmear only the weaker ſheep; in other places the whole. One man ſmears twenty or twenty-four in a day, leaving about an inch betwixt every ſhed of the wool.

The benefit expected from this practice is, that it makes the ſheep hardier and warmer, that it cleans them from vermin and cutaneous diſtempers, and that it prevents their loſing the wool. They contend further, that the wool pays very nearly the whole expenſe, the ſame number of fleeces of ſmeared and white wool bringing an equal ſum in the market, becauſe what the ſmeared wool wants in quality it has in weight: and laſtly it is urged, that "the more butter there is in the compoſition, the grain of the wool is ſofter and more ſilky; that by the practice of ſmearing, the young ſheep are raiſed in the bone, are preferred in the market, and fetch a better price."

But, "notwithſtanding all thoſe arguments in favour of ſmearing, others condemn the practice totally. There is little doubt that it forms a cruſt about the animal's body, and contributes to defend it from the cold, and thus it may be proper in a ſtormy ſituation while it is unneceſſary where there is plenty of ſhelter."

* Donaldſon's Preſent State of Huſbandry in Great Britain.

When the ſnow is falling or blown by a ſtorm, the ſhepherds, however, drive the flocks, without intermiſſion, round the top of a hill in a circle, in order to keep them from lowering and being drifted up or ſmothered. It is likewiſe the practice in ſome countries to erect circular folds on the tops of low hills for the ſame purpoſe: and when the heath is all covered, they ſometimes harrow the ſnow in order to bring up the heath; for which uſe the harrows ſhould only have few but long teeth. Some have recourſe to feeding with hay or unthraſhed oats in handfuls upon the ſnow *. But as theſe only afford a precarious ſupport, a proper winter food, well ſuited for their uſe and adapted to ſuch ſituations, would be of the greateſt value and and utility. It has been ſuggeſted by Mr. Marſhall, "that cultivating plots of furze, broom, juniper, &c. by ſod-burning, and rippling the ſurface, or by other more eligible means, could not fail of proving beneficial upon the wintering grounds of a ſheep-farm. By means of theſe, as a reſource in the deepeſt ſnow, when the herbage of the *braes* was buried too deep, and too evenly to be uncovered by the ſcraping of the ſheep, by keeping the moſt expoſed parts of the *braes* in full herbage for leſs general coverings of ſnow, and by reſerve of rape for the ſeaſon of lambing, even ewe flocks might be ſupported through the winter with ſome degree of certainty, without dry fodder, and without being left to the uncertainty of the ſeaſons, and the mercy of the winds and weather, as they are at preſent."

The produce or profit of keeping ſheep muſt obviouſly differ very conſiderably according to the circumſtances under which they are conducted, the nature of the breed that is employed, and the goodneſs of the management purſued in keeping them. There are ſo many cauſes that affect the profits in this ſort of huſbandry, that it is probable no two ſheep-farmers have exactly the ſame returns.

In the Annals of Agriculture†, ſeveral detailed ſtatements of the advantage of ſheep-huſbandry, when conducted on an extenſive ſcale, are given with much clearneſs and accuracy. In Suffolk, according to Mr. Macro's account (which was not made directly with the view of ſhowing the profit that may be derived from ſheep, but the diſadvantage of a ſtout flock), the profit on 494 ewes is £.16, or 8d. per head.

But in Suſſex, in Mr. Ellman's ſtatement, on 560 ewes it ſtands at £147, or 5s. 3d. per head.

And in the Duke of Graſton's eſtimate on 40 ſcore it is £.134, or 3s. 4d. per head ‡. From the late improvements in ſheep-huſbandry, it is probable that the

* Perth Corrected Report. † See Volumes II. VII. and XI.
‡ See Grazing.

preſent eſtimates ſtand much higher. The profits in the different ſyſtems of fatting ſheep have been already ſtated *.

Where the ſyſtem of folding is practiſed, the ſheep moſt adapted to the buſineſs are thoſe of the more light and active ſhort-woolled breeds, as the Norfolk, Wiltſhire, South-Down, and ſome other kinds. This management has been hitherto conſidered as almoſt abſolutely indiſpenſable in many ſituations to the ſucceſs of the farmer. It is, however, ſtated by Mr. Young, in his Calendar, that "a very great change has taken place on incloſed farms in the practice of the beſt farmers, eſpecially in Norfolk. They are now fully convinced, that it is an unprofitable practice, except where the openneſs of downs and common fields renders it neceſſary for the purpoſe of confinement. The number of ſheep that may be kept on a farm without folding is much greater than can be ſupported with it. This is a very eſſential point. There is a deduction from the farmer's profit, in the injury done by folding to both ewe and lamb, which has been eſtimated by experienced judges at from 2s. 6d. to 4s. per ewe; ſo that a farmer ſhould conſider well, before he determines to follow a practice which, from a multitude of obſervations, is pronounced unprofitable. Mr. Bakewell uſed to call it robbing Peter to pay Paul. The arguments now uſed in its defence are not ſatisfactory: it is contended, that if ſheep be not folded they will draw under hedges, &c. for ſhelter in bad weather; if ſo, they ought to be allowed to do it, for more would be loſt in ſuch caſes by forcing the ſheep from ſhelter than the value of their fold. Where this practice takes place, good ſhepherds will, in caſe of rain, get up in the night and let their flocks out of fold, knowing the conſequence of confinement on arable land in wet weather. The inſtinct of theſe animals will conduct them much better than our reaſon, not only where to fly for ſhelter, but alſo for chooſing their own time to go to reſt, and to feed in the morning. Theſe they vary according to ſeaſons and weather; but folding prevents it, and forces them to a regularity never called for by the weather."

It is remarked, that "when he began firſt to entertain doubts of the propriety of folding ſheep on any farms in which they can be kept to certain fields in the night, without that practice, he deſired earneſtly to try ſome experiments that might throw more light on the queſtion than it was poſſible for reaſon to do; but to effect this comparatively was very difficult, as the trial he wiſhed for was ſuch as ſhould carry ſome poſitive conviction with it. He has not been able

* See Grazing.

to effect it fully; but the trials he has made may not be found deſtitute of power to throw ſome light on this intereſting queſtion. He is perfectly perſuaded, that it would have been impoſſible for him to have kept on the ſame land nearly ſuch a ſtock in one parcel with folding. He does not conceive that the fields would have carried three-fourths, ſo managed. Four drivings in a day make them trample much food, diſquiet the ſheep, and transfer the choice of their hours of feeding and reſt from themſelves to the ſhepherd and his boy. While lambs are young they are injured by this, and the ewes are liable to be hurried and heated; all which are objects that ſhould weigh in the queſtion. When ſheep are kept in numerous parcels, it is not only driving to and from the fold that affects them, but they are, in fact, driving about in a ſort of march all day long, when the ſtrongeſt have too great an advantage, and the flock divides into the head and the tail of it, by which means one part of them muſt trample the food to be eaten by another. All this points the very reverſe of their remaining perfectly quiet in ſmall parcels. But the queſtion turns on the benefit to be reaped by the fold; for, if that be great enough to compenſate for the loſs by ſuch circumſtances, the practice may not be condemned."

Mr. Young ſuſpects that "the reaſon why farmers are ſuch warm advocates for folding, ariſes from the power it gives them of ſacrificing the graſs lands of a farm to the arable part of it. Their object is corn, by which they can carry off a farm whatever improvement they bring to it. Graſs improved is profit to the landlord in future; and tenants are too apt to think that this is done at their expenſe. They do not at all regard impoveriſhing a graſs field in order to improve a ploughed one; and he need not obſerve, that every ſort of ſheep-walk is thus impoveriſhed; ſo that antient walks, which have been ſheep-paſtured perhaps for five centuries, are no better at preſent than they ever were before; whereas moſt fields ſheep-fed, without folding from them, are in a conſtant ſtate of amelioration: this leads him to remark the effect he obſerved on ſeveral of his own fields. He attended through the courſe of a ſummer many gentlemen over his fields, with a view to examine whether the ſheep had ſeemed to have reſted only on ſpots, to the too great manuring of ſuch; or, on the contrary, to have diſtributed themſelves more equally; and it was a pleaſure to find, that they ſeemed generally to have ſpread in every part, if not quite equally, at leaſt nearly ſo. The improved countenance of ſeveral old lays fed in the ſame manner, when examined in autumn, convinced him as well as his bailiff, that the ground had been unqueſtionably improved conſiderably. Thoſe fields had carried a very bad appearance for ſome years; but they were, after

ſheep-feeding, of a rich verdure, and as full of worm-caſts as if they had been dunged. He rolled them heavily in November, but they ſoon became rough again by worms, and demanded much rolling in ſpring. They had afterwards a greener and more fertile appearance by far than ever they wore before."

It is concluded "that the whole of this circumſtance, the value of which he will be able to appreciate in the trials of future years, belongs to this method of dividing flocks, to the excluſion of folding. The fold is valuable, but ſo is the improvement of the graſs land, and may, for what he knows, nearly equal it: when, in addition, we include the greater number of ſheep that can be kept, and the favour done to them by letting them alone, there remains in his mind no further doubt of the fact. It is common to hear flock-farmers in open countries ſay, they have not the power to manage ſo. This may be very true, upon the major part of the farms; but ſuch have often many incloſures, in which this management might be applied without difficulty. But if we ſuppoſe folding to be the ſyſtem purſued, he may remark, that the farmers in thoſe parts of the kingdom which underſtand it beſt, do not extend it ſo far as they might; they give over folding in November or December, whereas it may certainly be carried on through the whole winter with profit; even ſuppoſing that the practice is *neceſſary:* on thoſe farms which have a perfectly dry gravelly paſture or two, it is adviſable to fold all winter on ſuch dry graſs land. It muſt not be attempted on moiſt arable land, nor on moiſt graſs land, but on dry paſtures. The ſafety to the ſheep is greater, and the benefit to the graſs an object."

Theſe are the arguments and experiments by which the utility of this long-eſtabliſhed practice is aſſailed and rendered problematical, at leaſt on farms in incloſed diſtricts, where the ſheep are capable of being confined in the paſtures or other fields in ſeparate lots without this management. How far, in other caſes, the injury ſuſtained by the ſheep in their thriving, and being more expoſed to diſeaſe, with the trouble and inconvenience of the practice, weigh againſt the advantage of the ſyſtem in providing manure as well as otherwiſe improving the tillage lands and keeping them in a more reſtrained ſtate by other means, remains to be ſhown. The deciſion of the queſtion involves various conſiderations of great moment to the ſtock- as well as tillage-farmer.

It has been ſuggeſted, that "there is another method of gaining all the benefit of folding quite through the winter, and on all ſoils; this is, to confine them at night in a ſheep-yard, well and regularly littered with ſtraw, ſtubble, or fern; by which means you keep your flock warm and healthy in bad ſeaſons, and at the

ſame time raiſe a ſurpriſing quantity of dung; ſo great a quantity, if you have plenty of litter, that the profit will be better than folding on the land. A great improvement in this method would be giving the ſheep all their food (except their paſture) in ſuch yard; viz. hay and turnips, for which purpoſe they may be brought up not only at night, but alſo at noon, to be baited; but if their paſture be at a diſtance, they ſhould then, inſtead of baiting at noon, come to the yard earlier in the evening and go out later in the morning. This is a practice which cannot be too much recommended; for ſo warm a lodging is a great matter to young lambs, and will tend much to forward their growth; the ſheep will alſo be kept in good health; and, what is a point of conſequence to all farms, the quantity of dung raiſed will be very great. If this method is purſued through the months of December, January, February, March, and April, with plenty of litter, one hundred ſheep will make a dunghill of at leaſt ſixty loads of excellent ſtuff, which will amply manure two acres of land, whereas one hundred ſheep folded (ſuppoſing the graſs dry enough) will not in that time equally manure one acre."

This buſineſs may be ſtill further promoted by means of proper yards ſuited to the extent of ſheep that are folded, with ſheds on the ſides for them to feed under; as in this way, by having the bottoms and under the ſheds well covered with turf, bog-earth, marl, or the ſcrapings of roads, in the autumn and winter ſeaſon, the ſheep being kept on them in the day-time in bad ſtormy weather, and always during the night, with plentiful ſupplies of ſtraw, ſtubble, fern, or any ſimilar ſubſtances as litter, ſo as that they may be preſerved quite dry and free from moiſture, a vaſt ſtock of good manure will be raiſed. Such yards or ſtanding folds, on this account, as well as that of improving the wool and affording ſhelter to the animals, deſerve to be much more general than they are at preſent. Theſe yards both with and without ſheds are in uſe in Suſſex*; with ſheds they are probably better than when wholly covered, as in the Herefordſhire method; for in this laſt mode it is probable the ſheep may be kept too warm, an equality of temperature being found of the moſt benefit in the economy of theſe animals. More experiments than have yet been made are wanting to ſhow the advantages that may be derived from different methods of houſing ſheep during the winter ſeaſon. There ſeems little doubt but that the quality of the fleece may be improved by it, though in the French manner it is ſaid to have done harm†.

Wherever the ſyſtem of folding is adopted as neceſſary, it ſhould be purſued with

* Annals of Agriculture, Vol. XI. † Annals of Agriculture, Vols. XI. and XVI.

as much ſteadineſs as poſſible, and have the buſineſs done in a perfect manner, for which purpoſe it may be ſufficient to allow two ſquare yards, or, in many caſes, a leſs ſpace, to each ſheep, having them to remain two nights or more on the ſame ſpot; though the uſual practice is to let them have more room, and remain a leſs time on the land. On tillage lands the ſurface ſhould be very thickly covered over; but when in the ſtate of ſward a ſlighter coat may be ſufficient. The lands under fallow for turnips or cabbages are in general beſt to begin upon, as the crops will be ready to be put in almoſt immediately afterwards. From theſe the farmer may proceed to the grounds in preparation for other crops, as the wheat fallows, being conſtantly attentive to put his ſheep upon ſuch lands firſt as are to be firſt ſown, whether with grain or graſs ſeeds. When on the approach of the winter ſeaſon the weather becomes too wet for purſuing this ſyſtem on the arable lands, it ſhould be transferred to the paſtures or other graſs lands; as on dry lands of this kind this management may be continued without much harm to the ſheep, and much improvement in the land be effected. Where there is much moſs on the lands this practice has much effect in removing it*.

The time of clipping or ſhearing the ſheep ſhould be regulated by the ſtate of the weather and the climate in the particular diſtrict, as the ſummer ſeaſon commences much ſooner in the ſouthern parts of the iſland than thoſe of the north. In this way the danger of injury by cold from depriving the ſheep of their coats too ſoon, and from heat by permitting them to continue on them too long, may be equally avoided. There is alſo another circumſtance that ſhould be attended to in this buſineſs, which is, that of the wool being at the ſtate of maturity; for if the clipping precede that period it is weak, and can ſcarcely be ſpun, and if protracted later, it is yellow, felted, and imperfect †. For the more warm ſheltered ſituations in the ſouthern parts of the kingdom, the beginning or middle of June, when the weather is fine, may be in general the moſt proper; but in the more expoſed diſtricts in the northern parts of the iſland, the middle or latter end of the ſame month may be more ſuitable, provided the ſeaſon be favourable. But with the fattening ſheep in the incloſures it will moſtly be neceſſary to perform the work at an earlier period in every ſituation, as the great increaſe of heat from the ſetting in of the ſummer weather added to the warmth of the fleece becomes very oppreſſive and injurious to them in their feeding.

As the fleeces of ſheep at this ſeaſon become much loaded and filled with duſt and

* See Folding, in Section on the Cultivation of Arable Land. † Annals of Agriculture, Vol. XVI.

dirt of various kinds, before the buſineſs of ſhearing is begun, it is neceſſary to have the operation of waſhing performed. In the old method of executing this work, by the waſhers ſtanding up to the breaſt in the water, there is not only much inconvenience and danger, in the men requiring a large ſupply of ſpirituous liquors, being attacked with colds, rheumatiſms, and other diſeaſes, but, from the uncomfortableneſs of their ſituation, often diſpatching the buſineſs with too much expedition, ſo as to leave the wool inſufficiently cleaned. It has been propoſed, in the way of remedying theſe inconveniences, that a ſtream or pond by a little contrivance will afford the means not only of doing the work well, but with comfort to the men. The method is to "rail off a portion of the water for the ſheep to walk into by a ſloop mouth at one end, and to walk out by another at the other end, with a depth ſufficient at one part for them to ſwim; and to pave the whole: the breadth need not be more than ſix or ſeven feet: at one ſpot let in on each ſide of this paſſage, where the depth is juſt ſufficient for the water to flow over the ſheep's back, a caſk, either fixed or leaded, for a man to ſtand in dry; the ſheep being in the water between them, they waſh in perfection, and puſhing them on, they ſwim through the deep part, and walk out at the other mouth, where is a clean pen, or a very clean dry paſture to receive them. Of courſe there is a bridge rail-way to the tubs; and a pen at the firſt mouth of the water, whence the ſheep are turned into it, where they may be ſoaking a few minutes before being driven to the waſhers*."

Before this work commences the lambs ſhould be ſeparated from the ewes and other ſheep, and each placed in ſeparate pens. When the forme are waſhed, it is ſeldom neceſſary to do much more than allow them to be juſt ſwilled through the water.

After this operation has been accompliſhed, the ſheep ſhould be provided with a dry clean paſture for a few days until they become perfectly dry, and are in a proper ſtate to be ſhorn or clipped.

In the former method of performing this ſort of operation, it was the cuſtom of the ſhearers to perform the work length-ways of the ſheep; and in many caſes it was very indifferently executed, ſo much ſo, that it has been ſuppoſed that one or two ounces of wool were left, upon the average, upon each ſheep, and by that means much injury done to the following growth, as it is conceived that wool in this particular has much reſemblance to graſs, and "will not thrive well if it be not cut cloſe." This imperfection in the clipping of ſheep is believed to ariſe in a great

* Young's Farmer's Calendar.

meaſure from the longitudinal method of performing the operation. The improved practice is therefore to clip circularly round the body of the ſheep, by which means the work is believed to be more evenly as well as more cloſely executed. It is ſuggeſted, as probable, that the firſt inducement to this method of executing the buſineſs was that of improving the beauty of the animals*. It is not unlikely but that convenience might alſo have ſome ſhare in the introduction of this improvement, as it is extremely awkward and unpleaſant for the operator to clip large ſheep in the longitudinal method. The origin of this mode of ſhearing ſheep is given, by Mr Young, to Lincolnſhire, whence it is ſuppoſed to have paſſed into Leiceſterſhire. And it has ſince that period been introduced among the Suſſex ſheep-farmers with much attention by the Earl of Egremont; while the late Duke of Bedford and Mr. Coke have not been leſs aſſiduous in making it known in Bedfordſhire and Norfolk †. It is therefore probable that it will not long be neglected by the ſheep-farmers in thoſe diſtricts where it may be yet unknown.

In managing this ſort of buſineſs, beſides the clippers, who are moſtly perſons that undertake the work, it is neceſſary to have a man to every three or four clippers, to draw and turn up the ſheep ready for the operation. The buſineſs is moſtly performed in a barn or other ſhady ſituation. Expert clippers ſeldom or ever cut or in any way hurt the ſheep; but where they are not well accuſtomed to the work this may eaſily be the caſe, and much injury be done: it is of courſe neceſſary to be cautious in engaging perſons for this ſort of work. The number of ſheep that can be clipped in the courſe of the day by an expert operator muſt vary according to circumſtances, but in general it is ſuppoſed to be about forty.

With the grazier, where this ſort of work is on a very extenſive ſcale, it is moſtly the cuſtom to have the work performed by the number. The uſual price is from 2s. 6d. to 3s. the ſcore, the clippers drawing their ſheep‡. But with leſs extenſive ſheep-farmers the work is often performed by the day, in which caſe 2s. 6d., with meat, ſtrong beer, liquors, &c. is the common price for each perſon §. Mr. Young ſtates the price in common clipping at "from 2s. 6d. to 3s. per ſcore, for waſhing, clipping, and winding, labour being at 1s. 6d. a day." At preſent we believe the expenſes run higher than theſe ſtatements.

It is neceſſary to have a proper perſon to wind the wool after the ſhearers, who ſhould perfectly underſtand the buſineſs, as much in the ſale depends upon this being well done, and that no improper ſubſtances be incloſed in the fleeces, as

* Young's Calendar. † Ibid. ‡ Synopſis of Huſbandry. § Ibid.

where this happens the farmer may find difficulty in diſpoſing of his wool in future.

Mr. Ellman, an extenſive South Down ſheep-farmer, clips off the coarſeſt of the wool on the thighs, and docks a month before the time of waſhing and ſhearing, which he ſells, as locks, at 3½d. per lb.; the quantity being about four ounces per ſheep. He finds this method to anſwer very well, keeping the ſheep clean and cool in hot ſeaſons. It is a practice in many other diſtricts with other breeds of ſheep, and is found to have many advantages, not only keeping the animals clean, but in ewes preventing their becoming ſore in the udder*.

Some have ſuggeſted the cutting or clipping of long-horned ſheep twice or oftener in the courſe of the year, about January and June, as by this means they ſuppoſe that there would be an advantage in having the ſecond cutting much finer, and if well kept the ſheep would probably ſuſtain no injury†. In an experiment made by John Aſkew, eſq. of Billingſburn in Northumberland, the firſt clipping was performed on the 9th of February, and the ſecond on the 24th of June, the ewes being ſheltered and fed with a little oats for ſome time afterwards; the reſult was, that both the ewe and the lamb continued in the beſt condition of any in the flock, and the quantity of wool was increaſed; the firſt clipping affording ſeven pounds and ahalf, and the ſecond three pounds and a half, making together eleven pounds; while in a year's growth clipped at once the weight was only nine pounds. The quality was likewiſe ſo much improved, that the ſecond clipping was worth eight ſhillings a ſtone more than the firſt. And it is ſuggeſted, that as the four months' growth was exactly of the proper length for carding, the long-woolled ſheep, inſtead of twice, may be clipped three times in the year‡.

The clothing of ſheep has likewiſe been attempted with a view to the bettering of the wool. In Mr. Brodie's experiment in this way the improvement in the wool is ſaid to have been very great. The expenſe about ſeven-pence per ſheep for two or three years. By combining this practice with the above, it is ſuppoſed that the combing-wool may be converted into that of the clothing kind, and that while the quantity and quality of the fleece is improved the carcaſe of the ſheep may be much benefited§.

The experiments on theſe intereſting points are ſo few, and the expenſe of ſuch management ſo little detailed, that no ſatisfactory concluſion can probably yet be

* Corrected Report of the North Riding of Yorkſhire. † Annals of Agriculture, Vol. XV.

‡ Ibid. § Ibid. Vol. XVI.

drawn. It ſhould not, however, be forgotten, that it has been in general conceived, that a certain maturity in the wool was neceſſary to its perfection, and that in the economy of ſheep an over degree of warmth may be equally detrimental with too great a deficiency of it.

The lambs are uſually clipped or ſhorn a month or ſix weeks after the operation has been performed on the old or ſtore ſheep. When this buſineſs has been done, both the old ſheep and lambs ſhould be marked with ochre or ſome other ſubſtance; and with ſome it is a practice to mark them in the ear or other part. It has been objected, that by marking with tar injury is done to the wool, but Mr. Macro has ſhown in the Annals of Agriculture, that the quantity employed does not amount to an ounce per ſheep, ſo that no great inconvenience can be ſuſtained by it.

It is a practice in ſome diſtricts to dock the tails of ſheep, which has probably originated in the idea of keeping the animals more clean, and free from the attacks of the fly. Some, however, conceive it improper, as preventing the ſheep from being able to beat off the flies in hot ſeaſons*.

The *caſtrating* or *gelding* of the male lambs is performed at different ages in different diſtricts; but it ſeems the moſt proper to be done in the firſt fortnight in the ſtronger ſort of lambs; and in thoſe of the weaker kind from a fortnight to three weeks, or a month old, according to circumſtances. Some, however, adviſe its being done at a much later period. While done early, there is, however, the leaſt danger of too much inflammation coming on, if the lambs be in a healthy condition. When performed while very young on tender delicate lambs, mortification may, however, ſometimes be apt to come on and deſtroy them.

The produce in wool differs greatly in different breeds of ſheep; but in the paſture or long-woolled kinds the quantity is very conſiderable, though very inferior in quality, to that of many of the ſhort-woolled ſorts. The fineſt wool is produced from the Shetland, the Herefordſhire, and the South Down, of any of the native ſheep, and the greateſt quantity from the Lincolnſhire. The quality and quantity afforded by each ſort of ſheep has been already noticed in ſpeaking of the particular breeds of ſheep.

It is obſerved by Mr. Donaldſon that, "the wethers have conſiderably more wool than the ewes. In the fleeces of either there are ſeveral qualities; ſome reckon eight or nine different ſorts. Theſe are all ſeparated from each other in England by a ſet of men called woolſtaplers, who are appointed for the purpoſe,

* Annals of Agriculture, Vol. IX.

and who are ſworn to do juſtice between the grower and the merchant or manufacturer.

The buſineſs of the ſhepherd is conſidered by the ſame writer as "very important; as on his due care and unwearied attention depend in a very great degree the welfare and value of the ſtock, and conſequently the profit of the owner. The buſineſs of a ſhepherd is to ſuperintend the flock at all times, and more particularly at the lambing ſeaſon, to take care that no improper tup intrude at the ſeaſon of copulating; to determine the proper time for ſhearing or clipping the fleece; to draw out ſuch ſheep as are in condition for the grazier or the butcher; and ſuch alſo, as from age or deformity, are improper to be kept longer in the flock. He ought alſo to have a competent knowledge of the diſeaſes of ſheep; of the proper remedies to be applied, and of the modes of application. In ſhort, he ought to be diligent and attentive; a competent judge of the good properties which the particular breed of ſheep of which he is to have charge ought to be poſſeſſed; and he ſhould alſo, eſpecially where the breeder is the grazier, be able to determine with preciſion what part of the flock is, and what is not, in condition for the butcher."

The uſual method of aſcertaining the age of ſheep is, as in cattle, by their teeth; they are alſo denominated one ſhear, two ſhear, &c. according to the number of fleeces that have been ſhorn from them. A ſheep of one ſhear, or of one year old, has two broad teeth before; a two ſhear ſheep has four; a three ſhear, ſix; and a four ſhear, eight, when it is ſaid to be full mouthed. After four, the teeth begin to break, ſhorten, and fall out. Sheep of different kinds and ages are alſo known by many other names in different diſtricts.

Sheep are liable to a great variety of diſeaſes both external and internal, and their nature highly deſerving of inquiry, but the ſubject is much too extenſive to be fully conſidered in this work.

The *Fly* is a diſeaſe to which ſheep are conſtantly expoſed in hot ſeaſons, eſpecially in incloſed woody diſtricts. Various remedies are in uſe for the prevention of the effects of this dangerous inſect. On the principle of its avoiding certain ſubſtances various applications have been made; but that which is found the moſt effectual, with the leaſt injury to the wool, is the flowers of ſulphur in combination with ſome ſort of greaſy ſubſtance, ſuch as lard, or butter, which can be drawn thinly over the wool by the hand. Where maggots are formed it has been adviſed, inſtead of cutting the wool off the part affected, and ſcraping them off with the points of the ſhears, that the wool ſhould be parted, and "the maggots picked out with a knife, or otherwiſe diſlodged, without breaking the coat; and a quantity of white-lead ſcraped from a lump among the wool; which being agitated,

the powder is carried evenly down to the wound. Too much diſcolours the wool; a little prevents any further harm from the maggots that may be left among the wool, driving them away from the wound; and, at the ſame time, is found to promote its healing. In well ſhepherded flocks, which are ſeen regularly twice a day, there is no ſuch thing as a broken coat *."

The *Foot-rot* is another diſeaſe that frequently attacks ſheep, and which ſhows itſelf by their lameneſs and the oozing of moiſture between the claws, with a highly diſagreeable ſmell: as the diſeaſe advances it gets under the hoof, throwing out proud fleſh. It is ſuppoſed infectious, from its ſpreading rapidly when not immediately eradicated. The part ſhould be pared and cleaned without touching the quick, and the gravel diſlodged, if there ſhould be any, as ſoon as the diſorder is diſcovered; the ſheep being removed from the reſt of the flock. A ſolution of the following ingredients ſhould then be dropped on the part, and the foot be kept dry and free from dirt: —two ounces of blue vitriol, the ſame quantity of roch-alum, one ounce of verdigreaſe, and a quarter of an ounce of muriated quickſilver diſſolved in a quart of good diſtilled vinegar †.

The *Scab* is a cutaneous diſeaſe, ſomething like the itch. When mild, and the cure attempted in time, waſhing with tobacco-water will often remove it without riſk. And ſulphur ointment ſtill more effectually.

But when the diſeaſe is more virulent, the cure is often attempted by the application of the common blue ointment of the ſhops, compoſed of quickſilver and hogs'-lard, in the proportion of two ounces of quickſilver to ſixteen ounces of lard: a pound of the ointment being ſufficient for four ſheep. The greateſt caution ſhould however be uſed in applying this ointment, eſpecially with ewes that have lambs, as the latter are liable to be deſtroyed by being ſalivated. It ſhould be laid on very ſparingly in ſheds at four or five inches apart.

The *Rubbers* are a ſort of itch, in which the animal rubs itſelf to death, being gradually exhauſted in conſequence of not being able to feed. No effectual remedy has yet been diſcovered ‡. The above may be tried.

Sheep are very liable to be affected with *blindneſs* from cold, and of courſe expoſed to much danger from ponds, precipices, &c. The cure is ſometimes attempted "by opening the vein below the canthus or inner angle of the eye, called the angular vein, then, by holding the creature's head in an inverted poſition, to make

* Rural Economy of Midland Counties. † Corrected Report of the North Riding of Yorkſhire.
‡ Lincolnſhire Report.

ſome drops of the blood fall into the eye, which operate two ways in effecting a cure of the *opthalmia*; firſt by moderating the increaſed action of the veſſels of that part, which is the proximate cauſe of the inflammation; and, ſecondly, the blood being admitted into the eye of the animal will act, by reaſon of its mildneſs and its warmth, as an emollient, which alſo contributes towards a cure. After this operation the white ſpecks on the eye are removed and the ſight completely reſtored. For this purpoſe ſome pound a little glaſs, that is blown into the eye with a quill open at both ends, which by its friction wears off theſe ſpecks or ſcales*."

A weak ſolution of verdigreaſe in diſtilled vinegar has alſo been found uſeful occaſionally applied by a ſoft feather. And it is probable that white vitriol might be uſed in the ſame way with advantage.

The *Rot* is a diſeaſe with which ſheep are frequently affected on moiſt wet lands. It is an affection of the liver and lungs, attended with a dropſy, and hitherto incurable. The chief thing to be depended upon in theſe caſes, is that of changing the ſheep to a dry ſituation, or keeping them warm and ſheltered, and giving them dry food in the yard†. On this ſubject a curious fact or two are ſtated in the Survey of Lincolnſhire. It is obſerved that in rotting years, "the ſheep that feed on the ſalt marſhes, over which the ſpring tides come, ſell very high in confidence that they are ſafe." And it is added, "that a ſhepherd, who, when young, was ſhepherd's boy to an old man who lived at Netlam, near Lincoln, a place famous for the rot, told Mr. Neve, that he was perſuaded ſheep took the rot only of a morning before the dew was well off: at that time they folded, being open field. His maſter's ſhepherd kept his flock in fold always till the dew was gone; and with no other attention his ſheep were kept ſound, when all the neighbours loſt their flocks‡."

The *Turn* or *Giddy* is a diſorder with which theſe animals are often ſeized. This is probably a ſpecies of hydrocephalus, or an encyſted collection of water in the head betwixt the dura and the pia mater, which in theſe creatures is always accompanied with a *vertigo*, or continual turning about. In Lincolnſhire, where it is termed "*ſturdy* or *bladder* on the brain, there is an old fellow, near North Somercots, who trepans for it, and ſaves as many as he loſes. He raiſes the ſkin with a ſharp ſtrong hooked knife over the ſpot affected, about the ſize of a crown piece; he then raiſes nearly the ſame ſize of the ſkull-bone, letting the piece hang as by a hinge on one ſide; then with a quill cut ſlanting to a point, like a ſpear, and barbed on each ſide, he

* Perthſhire Corrected Report. † Report of Yorkſhire.

‡ Much light has been lately thrown on the nature of this diſeaſe by Dr. Hartiſon in his "Inquiry into the Rot in Sheep and other Animals."

fiſhes in for the bladder, and brings it out whole, putting down the bone again, and covering with a plaſter."

It is ſtated by the author of the Experienced Farmer, that pulling ſheep violently by the ears, and then cutting them off, in theſe caſes, has with him effected a cure. Sheep in this ſituation among the South Down ſheep-farmers are ſaid to be *pateriſh**.

The *Reſp* or *Red-water* is another diſorder to which ſheep are expoſed. It is ſuppoſed to be induced by taking too much watery or ſucculent food, as turnips, rape, clover, eddiſh, and ſuch like rich vegetable produce. It is not peculiar to ſheep feeding on turnips or rape, as has been ſuppoſed. The uſe of common ſalt and frequent driving about has been ſuppoſed beneficial; and it is ſaid that the diſorder may be prevented by having recourſe to dry food in the night when the ſheep are feeding on theſe ſucculent plants.

The *Braxy*, as it is termed in Scotland, and which ſeems to be of the nature of the *gaſtritis*, is probably the ſame diſeaſe as the above: it is ſaid "to be not only the moſt fatal of all the diſeaſes of ſheep, but to have hitherto baffled all the ſkill and art of man. Some farms are more liable to this diſeaſe than others; and it was altogether unknown in the Highlands until they began to introduce a new breed, and to leave their ſheep at all ſeaſons in the fields. A change of graſs, eſpecially to clean graſs, or clover forage, in the latter end of autumn, has often been tried ſucceſsfully. The only remedy, indeed, ſeems to be, to try to prevent a diſeaſe which, after infection, "has in all inſtances been found hitherto incurable." It is found moſt fatal within the region of the hoar froſt; as it makes leſs havock and is ſcarcely felt in ſituations which are more elevated and more remote from the tracts of rivers, marſhes, or large bodies of freſh water.

"As an antidote againſt this diſtemper, the ſheep are ſometimes chaſed with dogs, and not allowed to remain long at once without being diſturbed, at the ſeaſon in which danger is apprehended; for whenever a ſheep ſtops, after having been annoyed, he paſſes water: and as the bladder is generally burſt of ſuch ſheep as die of the braxy, a part at leaſt of the complaint may be a ſtoppage in the urinary paſſage†."

The *Black-water* is a diſeaſe to which the beſt lambs are often ſubject in the autumn. They moſtly die very ſuddenly. The beſt preventative in this caſe is ſuppoſed to be that of keeping them in dry ſtubbles, or where the graſs is very dry.

The *Skits* in lambs both white and green are probably beſt removed by the uſe of

* Suſſex Report, 4to. Edition. † Dr. Robertſon's Survey of Perthſhire.

a decoction of chalk and hartſhorn-ſhavings with a ſmall proportion of tincture of opium. Sheep are liable to various other complaints, but they have been deſcribed in ſo vague a manner, and the remedies propoſed are of ſo doubtful a nature, that it could be of little utility to mention them.

It is probable that by the uſe of ſalt, eſpecially in wet ſeaſons, and on the wetter ſorts of land, where ſheep-huſbandry is practiſed, much advantage might be gained, in the health of the ſheep being better preſerved; eſpecially if ſome ſort of dry food was had recourſe to at the ſame time. It is a ſubſtance commonly employed in the ſheep-management of moſt other countries, and of which the animals are particularly fond, though the quantity conſumed is not great. The practice is to allow the ſheep to lick it up from ſhallow troughs. The heavineſs of the duty upon it is, however, a great bar to its being made uſe of in this way.

Horſes.—Theſe animals are indiſpenſably neceſſary, whether they be conſidered in regard to the ſaddle or performing the buſineſs of the road or the farm. The circumſtances which denote a good horſe, whatever the nature of the breed or variety may be, are, that the head be ſuitably ſmall in proportion to the animal; the noſtrils expanded; the muzzle fine; the eyes bright and prominent; the ears cloſe, ſmall and erect; the neck proceeding with a gentle curve from between the ſhoulders, ſo as to join gracefully to the head; the ſhoulders well thrown back, imperceptibly ſinking into the neck at the points; the arm or fore thigh muſcular, tapering ſo as to meet a fine ſinewy, ſtraight, bony leg; the hoof circular and wide at the heel; the cheſt deep and full at the girth; the loin or fillets broad and ſtraight; the body round, the hips or hooks not wide; the quarters long; the tail ſet on ſo as to be nearly in the ſame right line as the back; the thighs ſtrong and muſcular; the legs clean and fine boned; the leg-bones rather flat than round*. For the uſes of huſbandry the chief properties to be conſidered are, however, thoſe of ſtrength, activity, hardineſs and true draught.

The breeds of horſes have in general been conſidered as only two;—the blood or race-breed, and the black cart-breed. But whether this diviſion be well founded or not, the varieties are diſtinguiſhable from each other with equal eaſe by the appearances which they preſent.

The true bred blood-horſe is much too fine for the purpoſes of huſbandry; but when judiciouſly croſſed with the ſtrong ſort of cart-horſes, improved horſes for this uſe, as well as that of the ſaddle and light carriages, may be produced. By ſuch means the action, ſpirit, and pleaſantneſs of horſes may be greatly improved.

* Culley on Live Stock.

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G. Garrard del.

The Suffolk Punch Horse.

Printed for **Richard Phillips**, *71 St. Pauls Church Yard. Oct.r 23. 1804.*

The *Cleveland-bays* are a breed or variety of horſes that have derived much advantage in this way. They are principally diſtinguiſhed by their colour, which is moſtly bay; their form good; their ſize large; and their activity, ſtrength, and hardineſs ſuperior to moſt other ſorts*. With full blood ſtallions this variety is ſaid to afford excellent hunters and ſaddle-horſes; and with half-bred ſtallions excellent carriage-horſes and for the plough. They move quick, and are capable of great exertion. This valuable ſort of horſes is produced in different parts of Yorkſhire, Durham, and Northumberland.

The *Suffolk-punches* are another uſeful ſort of horſes for the purpoſe of the farmer. They are diſtinguiſhed by the colour, which is moſtly yellowiſh or ſorrel; by having a white ratch or blaze in the face; by the head being large; ears wide; muzzle coarſe; fore end low; back long, but ſtraight; ſides flat; ſhoulders too far forward; hind quarters middling, but rather high about the hips; legs round, and ſhort in the paſterns; deep bellied; full in the flank; not large in ſize†.

This on the whole, though but an ordinary ſort of horſe in regard to form, is found highly uſeful in draught, eſpecially for the plough and cart. Theſe horſes are very hardy, and capable of performing more labour than moſt other ſorts. They are moſt prevalent in the diſtrict of High Suffolk.

The *Clydeſdale horſes* are likewiſe a kind of horſes that anſwer well for the buſineſs of agriculture, eſpecially in hilly diſtricts. They are diſtinguiſhed by the colour, which is moſtly gray or brown; neck longer than in the Suffolk kind; head better formed; eyes more ſprightly and animated; body lighter and better formed; legs clean and ſinewy; ſtep firm but nimble‡; ſize larger, from fifteen to ſixteen and half hands.

This is a ſtrong, hardy, and active ſort of horſes, which is ſaid to have been produced by croſſing Scotch mares with Flanders ſtallions. They are remarkably true in the draught. This ſort of horſes is predominant in the diſtrict which bears their name in Scotland.

The *Heavy Black horſes* are a ſort that may be employed with advantage for ſome purpoſes of draught, but are not in general well adapted to the uſes of the farmer. This kind is diſtinguiſhed by the colour, being conſtantly dark black; by being clumſy in their form, and ſeldom well-proportioned; ſlow in their motion; with rough fleſhy legs; the ſize large.

This breed of horſes is found to prevail in the Midland diſtricts, as in Leiceſterſhire, Derbyſhire, Lincolnſhire, &c. where the mares are chiefly employed in farm-labour;

* Culley on Live Stock. † Ibid. ‡ Anderſon's Recreations in Agriculture, &c.

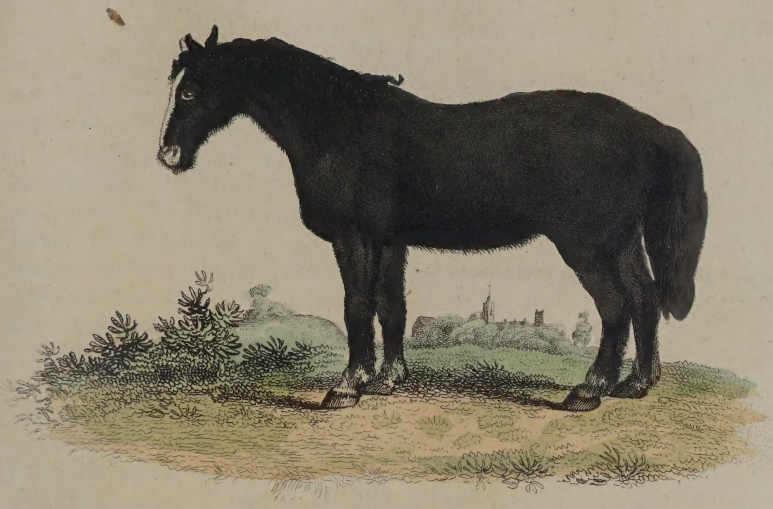
the horſes being diſpoſed of according to their ſizes; the largeſt for dray-horſes, the next for draught in waggons or other teams, and the ſmalleſt for the purpoſes of war.

The *Welch* and *Scotch horſes* are in general too ſmall for the purpoſes of agriculture.

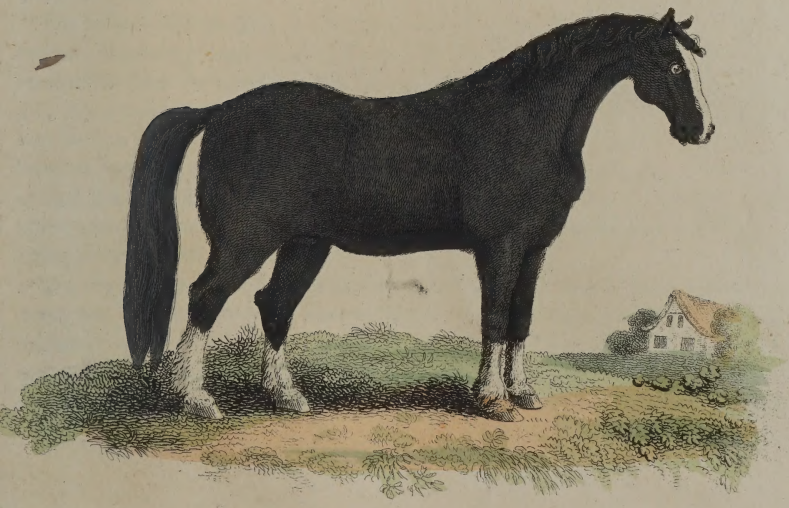
It is evident from the nature of theſe different ſorts, that for the purpoſes of farm-labour horſes muſt be chiefly ſelected from the Clevelands, the Suffolks, and the Clydeſdale kinds: the firſt affording ſuch as are adapted to great exertion and diſpatch; the improved ſort of the Suffolk kind being well ſuited to field-work where much perſeverance is required, as they can be conſtantly employed in this ſort of labour without inconvenience. And the laſt ſort, from the great muſcular exertion that can be occaſionally employed, as well as from their being true in the draught, are particularly ſuited to hilly ſituations. In reſpect to economy in keep and the expenſe in procuring, the two laſt ſorts are probably to be preferred, as they are both very hardy in their diſpoſitions, and can in general be obtained at eaſy prices. From the great advantage that has lately been found in employing, even for the purpoſe of draught, in the more heavy ſorts of carriages, ſuch horſes as have a little of the race or blood kind in them, the uſe of the heavy breeds is becoming daily leſs frequent and neceſſary.

The practice of breeding horſes, as it requires a great extent of paſture-ground and capital, from the great number of mares that muſt be conſtantly kept, and a deal of nice and attentive management in the ſervants that are employed, it is only in particular ſituations and circumſtances that it can be attempted with ſucceſs, as where the proportion of coarſe paſture-land, that cannot be converted to the purpoſe of grazing or fattening animals, on the farm is conſiderable. This is the caſe in the fens and marſhes of Lincolnſhire, and ſome parts of the North Riding of Yorkſhire*, as well as other diſtricts: In ſuch ſituations, however, with proper knowledge and due care in the management, great advantage may often be derived. Wherever this ſyſtem is undertaken, the ſame care and judgment muſt be exerciſed in ſelecting ſuch mares and ſtallions as are the moſt ſuitable for the particular purpoſe which the farmer has in view in breeding them, as have been recommended in the propagation of other ſorts of live ſtock, as without this ſort of attention it is impoſſible that the greateſt benefit can be obtained. The too common cuſtom of breeding from any mare that may chance to be in the poſſeſſion of the farmer ſhould never be adopted. It is

* Corrected Reports of Lincolnſhire and the North Riding of Yorkſhire.

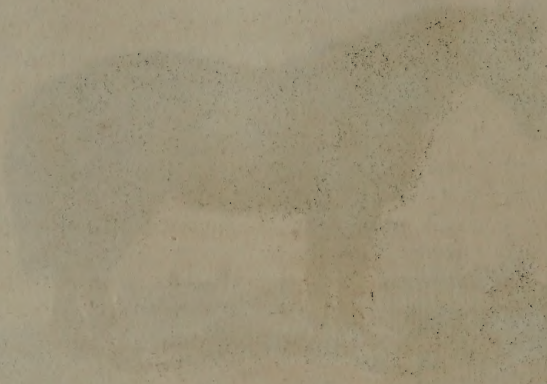


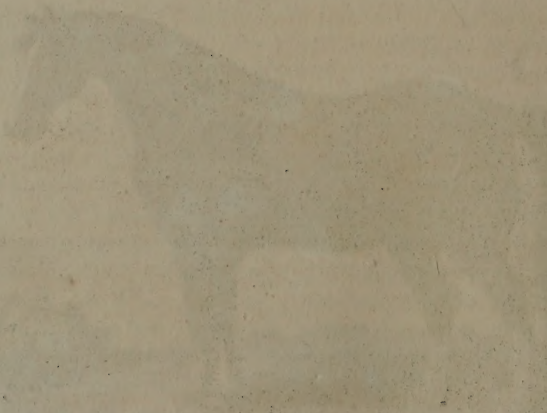
Old Cart-horse.



Improved black Cart-horse.

Publish'd Oct.1 1804, by Richard Phillips, *71. St.Paul's Church Yard.*





only by covering well-made and tried mares by ſtallions that are equally well-formed and known for their good qualities, whatever the breed may be, that valuable horſes can be produced.

The ſeaſon of putting the mare to the horſe is the ſpring, as April or May, as in breeding colts it is of material conſequence to have the foals dropped early, often ſo ſoon as in February or the preceding month*. In Yorkſhire the moſt uſual period of foaling is about May-day, and that of weaning towards the latter end of September. In the length of time that a mare goes with foal there is frequently conſiderable variation, but it is moſtly about eleven months. This is a circumſtance that ſhould be kept in mind by the breeder.

While with foal, it is of importance that the mare be kept pretty well, as in the contrary caſe the foal is ſeldom ſo fine or healthy. It is a practice with ſome farmers to perform the work of their farms with breeding mares; but this method requires much caution, and is always attended with a degree of danger. Beſides, it can ſcarcely ever be worth the farmer's while to breed where the foals will not defray the expenſe of keeping the mares without their performing much work, either before or after they have foaled. In ſome caſes, eſpecially with farm-mares, it may, however, be beneficial to work them a little carefully, by way of exerciſing them, but they ſhould not on any account be hard wrought when with foal or while ſuckling.

The foals ſhould continue to ſuck till towards the beginning of October or November, the mares being kept as well as poſſible, in order that their growth may not be checked from the want of milk while young. When taken from the mares at firſt, it is a very good method to let them have an open roomy houſe with a rack and box for their food; and if it communicate with a ſmall field or paddock, into which they can run, it is of great advantage in the rearing of the foals, both in the way of food and exerciſe, as they ſhould never be too much confined. By being more at liberty they become not only more ſtrong and healthy, but acquire more and a better action, which is eſſential in the horſe.

The dry food ſhould at firſt conſiſt of the niceſt and moſt ſweet hay of whatever ſort it may be. Sweet green *rouen*, where it can be provided, might be very uſeful in this intention. Carrots are likewiſe found an extremely beneficial ſort of food in the rearing of foals. It has indeed been thought ſcarcely poſſible to breed horſes to any profit without a conſiderable dependence upon them†. Their laxative property is alſo

* Annals of Agriculture, Vol. XXXIV. † Ibid.

ſuppoſed by ſome highly beneficial in the raiſing of foals*. With theſe ſorts of food it is neceſſary always to make use of oats and bran or pollard in ſuitable proportions, as it is only by theſe means that theſe young animals can be brought forward in the beſt manner. When there is ſufficient graſs in the ſpring, it is a proper practice to turn the foals out into a convenient dry paſture, where there is rather a ſhort ſweet bite, and a good ſupply of pure water for them to drink at as often as they like. In the ſecond winter leſs care will be required than in the firſt; but the ſame indulgence, in reſpect to the liberty of their going in and out of the ſhed at pleaſure from the field, ſhould be allowed. In this mode of rearing foals they will become uſeful at two years old when intended for the work of the farm, and if for ſale be in a condition to fetch a good price; which would not be the caſe if they were kept in an inferior way. But there is another circumſtance to be taken into the account, which is, that it is this variation in the keep that conſtitutes the difference between a good and bad horſe; which, as it chiefly conſiſts in the addition of the oats, is no very great affair, at leaſt upon good horſes, whether for ſaddle or work. Upon horſes of low value, it will not probably repay the breeder to beſtow this ſort of keep upon them. It can ſeldom be adviſable for farmers to purſue it in horſes that are worth leſs than from twenty-five to thirty pounds at four years old: where oats are made uſe of as a part of the food of young horſes, care ſhould be taken that they are *really* given to them.

In ſome parts of Yorkſhire the farmers, inſtead of breeding foals, purſue the ſyſtem of buying colts in yearly, when two or three years old, which they keep till four or five, uſing them for the purpoſes of the farm: they are then ſold to the London or other dealers. By this management their ſtock is kept up, and they make a conſiderable annual profit, beſides having the internal work of the farm performed. They are principally employed in the plough, and in many caſes not ſhod till the period of being ſold. When intended for the carriage, this eaſy ſort of work is found of advantage in rendering them more quiet and tractable†. In other diſtricts it is the practice to buy in at three years old, in the autumn, keep them during the winter on ſtraw, work them a little in the ſpring, and ſell them in the latter end of ſummer at the fairs in the vicinity, by which method good judges make money‡.

The Yorkſhire farmers, who moſtly raiſe their foals from their working mares, are often careful not to allow the foals to ſuck till the udders of the mares coming

* Experienced Farmer, Vol. II. † Corrected Agricultural Report of the North Riding of Yorkſhire.
‡ Corrected Agricultural Report of Lincolnſhire.

from work have been well bathed with cold water, and a great part of the milk drawn away.

The propriety of caſtrating horſes has been diſputed by ſome, as being diſadvantageous in the loſs of vigour that it cauſes. The practice certainly proceeds on the principle of ſacrificing a portion of the ſtrength of the animals to the convenience of managing them. This in many inſtances is without doubt neceſſary as well as convenient; but there can be no difficulty, by proper management, in making ſtallions perform the buſineſs of the farm, which, from their ſuperior ſtrength, is ſuppoſed by ſome, on experience, to be executed with great advantage over that of uſing geldings*.

Where the operation of gelding is to be performed, the beſt time is probably when the foal is about three months old, though ſome prefer a much more advanced age, as ſix or twelve months, and even more in ſome caſes. In all animals there is, however, the leaſt danger of inflammation while they are young in performing ſuch operations. Beſides, it is better to cut colts before they have any propenſity to hanker after the mares, and get bad habits†. When the foals are early, and the weather is not too hot, the latter end of May or beginning of June may be a good and proper ſeaſon.

Some of the Yorkſhire breeders, however, think that they find advantage in deferring the operation till the horſes are two years old, as they ſuppoſe "they become ſtronger and handſomer for it." And where the operation is done at one year old, they find that the foals have not recovered the check they ſuſtained by weaning before they experience another in this operation. They experience no difference in their recovery at two years old than one. The foals ſhould be kept up ſome time before the gelding is to be performed.

In performing the operation, the beſt method is that of cutting open the *ſcrotum* or cod with a ſharp knife for the purpoſe, dividing the ſpermatic cords and veſſels, taking out the teſticles, and then ſecuring them by means of ligatures, cloſing the wound immediately, the ends of the ligatures being left out at ſome part, ſo that they may be drawn away as ſuppuration advances. This is much better than the old practice of ſearing with a hot iron, or the more recent one of cauſing the ſeparation of the ſcrotum and teſticles by *twitching* or tying them tight with a ſmall ſtring.

In the breaking of horſes there is ſeldom much trouble if the buſineſs be well managed and undertaken ſufficiently early. In farm-horſes the beſt method is probably that of haltering the foal as ſoon as it is taken from the mare, leading it

* Annals of Agriculture, Vol. XXXVI. † Experienced Farmer, Vol. II.

from place to place till it becomes perfectly quiet and manageable; then to have it tied in the ſtall and cleaned in the manner of the other horſes, accuſtoming it to have its feet taken up and cleaned when neceſſary. Theſe methods ſhould be continued till it becomes perfectly tractable; it may then be put into the middle of the team in proper harneſs, ſo as that it may be forced about by the other horſes, without having any thing to draw. When it is quite gentle in this ſituation it may be backed, if that has not been done before. In order to give it a mouth, a ſmall bit ſhould be let hang looſe in its mouth till it becomes accuſtomed to it, and then it may be managed in any way at pleaſure, being taught not only to walk, but trot, and even gallop well. In this treatment it ſoon becomes perfectly tractable and fit for any uſe on the farm.

In making young horſes, as two-year old colts, up for ſale in the autumn, the Yorkſhire breeders turn them into good graſs, taking them up about a week before the period of ſelling to reduce the carcaſe, improve the coat, and teach them to lead. They are moſtly diſpoſed of to ſale with their full tails. Maſhes of bran, ground oats, and boiled corn are then given them by theſe perſons for two or three months, and various other operations practiſed upon them in order to render them more ſaleable*.

It is a queſtion that has been much agitated, whether horſes or oxen are the moſt economical and advantageous for the purpoſes of the farmer in performing his work, and which is not yet fully decided. The circumſtances in which the latter have been chiefly ſuppoſed to be more advantageous than the former, are in their being kept at leſs expenſe, and their not declining in value. But theſe, when examined, are probably not ſo deciſive of their ſuperiority as they may at firſt ſight appear; for where the work of the farm is done by the younger ſort of horſes, which is perhaps the beſt method, the decline in value cannot be of any material conſequence, while the ſuperiority in point of the diſpatch of work is very great. And in regard to the keep, as oxen cannot perform their labour well in continuance without oats or ſome other ſuſtenance of a ſimilar kind, it would ſeem not improbable but that young horſes may pay nearly as well as oxen, and be kept with little difference in the expenſe. The principal difference appears to be in the oxen being ſupported at leſs expenſe when not employed. But horſe-teams under proper management ſhould never be unemployed.

The common opinion, that oxen are ſuperior to horſes in the tillage of heavy

* Corrected Agricultural Report of the North Riding of Yorkſhire.

lands does not appear to be well founded, eſpecially where drawn in yokes, as the poaching muſt be greater than by horſes working at length. But when in harneſs they may, from their greater ſteadineſs, be preferable. Under different management they are conſequently capable of being employed in both ways.

Horſes are however greatly ſuperior to oxen, where quick motion is of more importance than the ſteady drawing of heavy weights; and alſo in carting, where great ſpeed is required in the unloaded ſtate; and wherever the roads or lands are rough, ſharp, and ſtony, as they cannot be ſhod ſo well as horſes to ſtand ſuch roads. In harrowing with light harrows, where a jumping irregular motion is neceſſary, horſes are likewiſe ſaid to be the moſt proper*.

Mr. Young, in his valuable Calendar of Huſbandry, has however well remarked, that "there are two caſes in which oxen are certainly more beneficial than horſes: Firſt, when a farmer lives in a diſtrict where there is a breed of cattle well adapted to work; and, ſecondly, when his farm is ſo large that he can buy in a conſiderable lot of cattle annually, at a ſmall expenſe per head, and feel no inconvenience in turning out ſuch beaſts from the teams to fattening as do not work well. In both theſe caſes he has little doubt of the ſuperiority of oxen to horſes. But in countries that do not poſſeſs a breed of cattle well adapted for work in the ſtate of oxen; and on ſmall farms, whence fairs muſt be attended at the diſtance of a hundred miles to purchaſe a few, and conſequently at a great expenſe per head, and poſſibly without land for fattening any, the benefit will be very queſtionable. In ſuch a caſe he ſhould prefer the bulls of the country, which are every where to be procured probably much cheaper than oxen; are broken in with but little difficulty; which work well, and which will recover from fatigue ſooner than any ox. This he believes from what he has experienced, and from all the information he has procured, is ſtating the queſtion of the compariſon of horſes and oxen as nearly to the truth as it can be done in few words. There are, however, ſome works in the buſineſs of a farm, in which horſes are better than either oxen or bulls, and therefore it may be advantageous to keep a few horſes†."

The feeding of teams, whether of horſes or oxen, is a point that demands much care and attention, as a want of economy in this reſpect may leſſen the profits of the

* Annals of Agriculture, Vol. XXXVI.

† In comparing the expenſes in the different ſorts of teams, it is remarked in the Survey of the North Riding of Yorkſhire, that where young horſes are employed in the cultivation of farms during their growth, and then ſold, the horſe-team will be the moſt profitable. But as this mode can only be limited where

farmer in a very material degree, as is evident from the greatneſs of the conſumption of expenſive food. It has been found, that working horſes, without being fed too highly, or ſo as to improve in fleſh, have conſumed in the proportion of twenty

blemiſhed, aged, or other horſes to be worn out are made uſe of, the ox-team will be moſt advantageous both to the farmer and the public.

The following ſtatements ſhow the advantages of the different methods:

Expenſe of Horſe-Team per Annum.

DEBTOR.	£.	s.	d.	CREDITOR.	£.	s.	d.
One three-year old horſe	14	0	0	By labour 200 days in the year, ſuppoſing them to plough one acre one rood per day, which, at 5s. per acre, is 6s. 3d. per day, but deducting 2s. per day for the man's wages—their labour will be 4s. 3d. per day	42	10	0
One four-year old horſe	18	0	0				
Hay, or graſs, for two horſes, at 4s. per week each, for fifty-two weeks	20	16	0				
Corn for ditto, 200 days, at one peck and a half each day—nine quarters three buſhels, at 18s. per quarter	8	8	9				
One year's intereſt of the firſt coſt of the horſes	1	12	0	The improved value of the four-year old horſe	18	0	0
Shoeing	1	5	0	A five-year old horſe, ſold for	22	0	0
Profit	18	8	3				
	£. 82	10	0		£. 82	10	0

Expenſe of Ox-Team per Annum.

DEBTOR.	£.	s.	d.	CREDITOR.	£.	s.	d.
A pair of four-year old oxen	22	0	0	By labour 200 days, ſuppoſing them to plough one acre per day, which, at 5s. per acre, is 5s. per day, but deducting 2s. per day for the man's wages—their labour will be 3s. per day	30	0	0
Hay, or graſs, for ditto, fifty-two weeks, at 3s. each	15	12	0				
Intereſt of the firſt coſt of the oxen	1	2	0				
Profit	16	6	0				
	£. 55	0	0	Suppoſe the oxen are worked two years, the value of them at ſix years old would be about 28l., which makes the improved value in one year	25	0	0
					£. 55	0	0

pounds of good hay each in the courſe of the day, with a weekly allowance of two buſhels of oats each and chaff. With a ſmaller allowance, which is often made by farmers, they cannot be kept conſtantly at work without falling off in condition,

Expenſe of Horſe-Team per Annum.

DEBTOR.	£.	s.	d.
By wear and tear of two horſes, value 30l. ſuppoſing them to laſt ten years	3	0	0
To intereſt of prime coſt	1	10	0
Hay and graſs	29	16	0
Corn	8	8	9
Shoeing and farriering	1	5	0
Profit	7	12	3
	£. 42	12	0

CREDITOR.	£.	s.	d.
By value of their labour	41	10	0
By value of their ſkins, 22s.	1	2	0
	£. 42	12	0

Expenſe of Ox-Team per Annum.

DEBTOR.	£.	s.	d.
Intereſt of prime coſt of a pair of four-year old oxen, value 22l.	1	2	0
Hay, or graſs, for ditto	15	12	0
Riſk and accidents	0	10	0
Profit	13	16	0
	£. 31	0	0

CREDITOR.	£.	s.	d.
By value of their labour	30	0	0
Suppoſing them worked ſix years, the value of them would be then 28l. bearing an annual profit of	1	0	0
	£. 31	0	0
The profit of two oxen working one year, is	13	16	0
Ditto, of two horſes	7	12	3
	6	3	9
But as you muſt keep one-fourth more oxen to do the work of two horſes, the profit of working your farm with oxen would be one-fourth more	3	9	0
If, therefore, the labour which required two horſes to perform it, were performed with oxen, the profit of the oxen would be greater than the profit of the horſes, by	£. 9	12	9

by which there muſt ultimately be a loſs to the farmer. The above allowance is neceſſary for about twenty weeks during the winter*.

To leſſen the heavy expenſe of keeping farm-horſes, it has been ſuggeſted that there are only two methods; one of which is, not to turn them out in the ſummer, but to have them ſoiled conſtantly in the ſtables or yards with lucern, tares, and clover; as in this way, where littering is properly attended to, the manure that is produced will nearly balance the expenſe of the keep, beſides avoiding various inconveniencies attending the paſturing of horſes in the fields. The other mode is that of ſubſtituting carrots in the place of oats, as a winter food; a practice common in the county of Suffolk, and attended with much ſucceſs †. Eſtimating the prime coſt of carrots to the farmer at three pence the buſhel, and that of the oats at ten ſhillings the quarter‡, and allowing the cuſtomary quantity of one buſhel of carrots a day againſt the two buſhels of oats in the week, the horſe at carrots conſumes in the proportion of 1s. 9d. a week; while that at oats is 2s. 6d. Beſides, the ſuperiority of this proportion of carrots to that of the oats, in the ſupport of the horſe, is very conſiderable; probably five buſhels of carrots per week would be equal to it, as in this diſtrict they conſider a buſhel a day feeding highly§.

But, beſides this excellent root, there are others that may be made uſe of in feeding horſes in order to ſave oats: boiled potatoes with a little chaff and a few carrots have been attended with perfect ſucceſs in the trials of Mr. Guthrie in Scotland, keeping the horſes in fine order without any oats‖. And in England they have been applied in the ſame way with ſimilar ſucceſs.

There is another point to be regarded in the feeding of horſes, in order to its being done in the moſt economical manner, which is that of having as much of their

"Thus, four horſes working upon a farm, do not appear to leave as much profit, by this laſt mode of cultivating it, as five oxen would, by the ſum of 19l. 5s. 6d.; while the former mode of cultivating it by horſes would leave a profit of four guineas in favour of the horſes: the balance, therefore, on the whole, is in favour of the oxen, by the ſum of 15l. 1s. 6d."

* The keep in a team of four horſes may be eſtimated in this way, according to the preſent prices of the different articles of food:

	£.	s.	d.
Winter-food — To 7 tons of hay at 4l. per ton,	28	0	0
To 26 quarters of oats at 28s. per quarter,	36	8	0
Summer-food—To graſs 26 weeks at 20s. per week,	26	0	0
To 13 quarters of oats	18	0	0
	108	12	0

Or per horſe without chaff 27l. 2s.

† Annals of Agriculture, Vol. XXXVI.

‡ Theſe prices are much too low for the preſent, but they ſerve to ſhow the difference in the expenſe.

§ Annals of Agriculture, Vol. XXXVI. ‖ Ibid.

dry fodder as poſſible, ſuch as hay and ſtraw of different kinds, cut into chaff, before it is given to them with their other food. And it is probable that by having the oats broken or bruiſed, not ground, as has been often recommended, ſome ſaving in that expenſive article may be made*, though it has been contended by ſome that horſes do not thrive ſo well when the oats are prepared by grinding. It is probable that, when reduced into too fine a ſtate, they may not be ſo well digeſted, from their being ſwallowed more greedily, and without the *ſaliva* of the animal being ſo intimately blended and combined with the ſubſtance of them, as when left ſo as that ſome degree of chewing becomes neceſſary. But even when given in the whole ſtate, ſome horſes ſwallow much of them without due maſtication, as is obvious from their being voided in a perfect ſtate, and ſo little changed as to be capable of ſupporting poultry and other granivorous birds. Conſequently ſomething in this matter depends upon the habits of eating in the horſes.

By the uſe of barley inſtead of oats, perhaps ſome degree of ſaving might be made, as that ſort of grain would go farther than oats in the ſame proportion. It has been objected to in this intention by ſome, from its ſuppoſed heating quality: but from its having a more laxative or opening property than oats, it would ſeem to have the contrary effect; and as a proof of which, it is found to be the ordinary food for horſes in moſt hot countries†. It may probably be more unfavourable from its aperient property in many caſes, in the feeding of horſes, than that of its ſuppoſed heating tendency. Experience has however ſhown that it is a hearty and nutritious food when applied in this way ‡.

In ſituations where the *furze* or *whin* plant§ can be grown with facility, a degree of ſaving in the hay as well as corn may be effected by the uſe of it, cut green while young and bruiſed in mills for the purpoſe. It has been found from ſome experiments that an acre will afford fifteen tons of this ſort of food, and by others as much as will feed ſix horſes for ſix months ‖.

In the feeding of ox-teams, equal care and attention is neceſſary to ſee that while they are perfectly well ſupported, no waſte of food is made; which is often the caſe with incautious feeders. When at hard work in the autumn and beginning of the ſpring ſeaſons, they ſhould have a good ſupply of hay, ſtraw, and cut-chaff, with a daily allowance of ſome ſort of roots, ſuch as turnips or carrots, or a ſufficient proportion of cabbages, as from forty to fifty pounds weight where the oxen are large. But during the ſummer they may be ſoiled in the ſtalls or yards in the manner of horſes, a full ſupply of litter being provided, and water for them to drink when

* Lord Dundonald on the Connexion of Chemiſtry with Agriculture.
† Annals of Agriculture, Vol. XXXVI. ‡ Lord Dundonald. § *Ulex Europæus.*
‖ Annals of Agriculture, Vol. XXXVI.

wanted. When at plough in the beginning of the autumn, it will be neceſſary to give them oats and cut chaff in ſuch proportions as may be requiſite, as the graſs at that period begins to be leſs nutritious.

In the working of teams, whether of the horſe or ox kind, one circumſtance is to be conſtantly kept in view; which is, that, as their keep is ſo very expenſive, they be always employed; as it is obvious that if they ſtand idle half or a third of their time, the labour that is performed muſt coſt the farmer double, or a third more than in caſes where they are conſtantly at work, and of courſe much loſs be ſuſtained. On arable farms this is particularly neceſſary to be attended to; and of courſe in the autumn and winter, when the buſineſs of the plough is at a ſtand, other ſorts of team-work, ſuch as carting, in the former, on light dry ſoils, chalk, marl, and clay, and on the wetter graſs lands, manure, in ſmall carts; and in the latter, in froſts, manures of the compoſt or other kinds, removing various ſorts of earthy materials from borders and other places, for mixing with or forming the bottoms of dungſteads; and when the weather is open, in taking the corn, and bringing manure, or any other buſineſs that is to be done; as it muſt always pay the farmer to have it accompliſhed in ſuch circumſtances as that the team muſt otherwiſe remain unemployed. The keeping of teams upon poor food, ſuch as ſtraw, during the winter, in order that they may not be in work, is always bad management, as their labour in the reſt of the year muſt ſtand the farmer very high.

In the ſeed-time the farmer ſhould be careful that they perform a proper day's work. It has been obſerved by Mr. Young, that in this ſeaſon the farmer "ſhould not let them work leſs than nine or ten hours; but this he will not be able to effect, if the ploughmen have to take care of their horſes. It is the beſt to have horſe-keepers, for the mere attendance of the teams, ſo that the men who hold the ploughs may have nothing to do but the mere ploughing. Let the horſe-keeper have the horſes fed and harneſſed ready for the ploughman, to be in the field by ſix o'clock. At eleven they ſhould come home for an hour and a half to dine and bait, during which time the horſe-keeper is in attendance again. At half an hour after twelve, they ſhould go out again, and work till half an hour after five, when the horſe-keeper ſhould again take the teams. By this method a pair of horſes in a well-made plough will, without any driver, plough an acre and a quarter, or half, very eaſily; and no object is more important, than the plough's doing a good day's work in the ſpring of the year. The conſequence, eſpecially of making the moſt of dry weather in March, is extremely great. One acre ploughed and ſowed then may be fairly worth two that are left till the beginning of May."

When the fields are at a diſtance, it may however be more adviſable to have the

teams baited in them than to come home for the purpoſe, eſpecially in the autumn and winter ſeaſons when the days are ſhort.

Where the above management is adopted, a great deal more work will be done, than when the *carter* or *head man* has the care of cleaning and managing the horſes, as, in order to give himſelf more time, he takes every means of ſhortening the day's work. An odd man, who can be occaſionally employed on other jobs, and fully depended upon, may be proper to be made uſe of as horſe-keeper; the farmer being attentive to ſee that the horſes be well cleaned in the more concealed as well as other parts*.

Mr. Banniſter remarks, that "the management of the plough team varies eſſentially in different counties, and even in different parts of the ſame county, whether the labour to be performed as a day's work by the ſame number of cattle, the quality and quantity of their food, or the ſtated hours for baiting and attendance, be conſidered. In the eaſtern part of the county of Kent, the waggoner or head ploughman pays an early regard to his horſes, and baits them continually with chaff and corn from the time of his riſing, at four o'clock till ſix or ſeven, when the day's work commences; and in the afternoon, whilſt the mate is baiting, the waggoner employs himſelf by cutting *caving* into chaff, or, where this is not in ſufficient plenty, hay and ſtraw mixed, and ſometimes oats in the ſheaf. At eight in the evening he goes to bed, and leaves the attendance on the team to his mate, who ſits with them till ten, ſo that the horſes are left but a few hours to themſelves; and this diligent attendance is unavoidably neceſſary, ſince in this part of the county the horſes are not permitted to have any rack-meat, but have generally a full allowance of corn; whereas, on the other ſide of the county, the ſtable-door is rarely opened of a morning before five or ſix o'clock in the winter, and by nine in the evening the horſes are racked up and left to their repoſe; and as by this method of giving the horſes rack-meat the leſs chaff is required, ſo there is generally a ſufficient quantity of this produced by the thraſher; if not, the labour of cutting does not often fall to the ploughman, but is paid for by the farmer to a perſon who is expert at this buſineſs."

By the former practice there is, it is obſerved, a reſerve of a conſiderable quantity of fodder, which, when given to the horſes without limitation, forms a large item in the rural account at the end of the year, eſpecially when the ſituation is within a ſmall diſtance of London, or any place of conſiderable note, where hay uſually fetches a large price; to which may be added the advantage which the horſes reap from the conſtant attendance that muſt neceſſarily be paid to them when baited in that manner: beſides, the ſervants are kept continually in their work, and prevented from loitering away the afternoons at the ale-houſe or the ſmith's ſhop, as is too frequently the

* Annals of Agriculture, Vol. XXXV.

caſe with thoſe who have more leiſure on their hands; a great expenſe is likewiſe ſaved, which muſt otherwiſe be paid, for cutting chaff. On the contrary, where the more general cuſtom of allowing rack-meat to the horſes is practiſed, the following advantages may be derived: the weekly allowance of corn may be more ſparing, and the rack-meat need not be wholly confined to hay, but conſiſt partly of pea- or bean-ſtraw, at thoſe times when the labour of the horſes is light; and in ſeed-time, or whenever the team is taſked with heavy work, though ſaintfoin, clover, &c. may be allowed them of a night, yet this need not be given in ſuch large proportions, which would quickly conſume a large quantity, but be truſſed out in ſuch proportion as may be thought expedient, obliging the ſervants to tend the horſes with chaff in the afternoon. Under theſe reſtrictions, the conſumption of fodder may, perhaps, not exceed in value the ſheaf corn allowed to the teams in the former management.

Another circumſtance in favour of this practice is its leaving the ploughman at leiſure in the afternoon to be employed about occaſional jobs, while in the contrary mode the ſervants have a juſt excuſe for refuſing to help in any other work than what appertains ſolely to the management of their horſes.

There is alſo a third conſideration which may ultimately turn out of more conſequence than either of the former, and that is the opportunity enjoyed by the farmer who gives his horſes rack-meat, of ſeeing the ſtable-door locked up at night and opened again in the morning; which cannot be ſo conveniently done where the ploughman is to ſit up late and to riſe the next morning at three or four o'clock; and thus an object of the moſt ſerious import is left to the care of perſons who are rarely deſerving of any truſt; namely, the danger from fire, as well as the great waſte of candles.

Some adviſe the keeping of team-horſes in ſtables, with ſhort ſtalls for each horſe, ſo that he may eat his feed ſeparately, and be harneſſed with more eaſe, the partitions not being carried to the cieling, in order to admit of a more free circulation of air; while others contend for open ſheds with racks and mangers fixed below, having a pump and ciſtern, and a ſmall yard for them to go into at pleaſure, as in this method they are found to do better without dreſſing, than in ſtables with the ordinary management beſtowed by farm-ſervants*. In the practice of the Earl of Darlington it was found to anſwer well. In Suffolk it is likewiſe the practice with many to turn them into the farm-yard in the nights. The open ſhed method with yards does well for feeding on hay and carrots in winter, and ſoiling on green food in the ſummer, but they ſhould be kept conſtantly well littered down.

It is probable however, as horſes ſeldom do very well when much expoſed to cold,

* Annals of Agriculture, Vol. XXXVI.

that the ſtable ſyſtem may have its advantages in the more northern diſtricts; while the open ſhed mode may be preferable in the ſouthern parts of the iſland, where the winter ſeaſon is more mild and favourable.

Corn-cheſts and chaff-bins ſhould likewiſe be provided, and it is of conſequence to have them conveniently placed for the purpoſe of feeding the teams. The former ſhould be of ſufficient dimenſions for containing the weekly allowance of corn for the team, and be placed on blocks of wood on the ground, being furniſhed with a proper meaſure and ſieve to mix the feed in, with the cut chaff. Each carter ſhould have one, and be provided with a lock and key to it; the chaff-bin muſt be placed in the centre of the ſtable when ſmall, and in large ones two may be neceſſary: they ſhould be made from about five to ſeven feet ſquare each*.

The expenſes attending teams are liable to vary ſo very much, according to the horſes, the manner of feeding, and other circumſtances, that it is difficult to ſtate it with any degree of accuracy; but that which is given below is probably pretty near the truth, as the amount of oats for well-fed horſes is moſtly found to be about ten quarters, and that of hay a ton and three quarters. Shoeing about ſixteen ſhillings. The reſt of the items being liable to much variation†.

There is another point in reſpect to teams which it is extremely difficult to aſcertain, though it is of great importance to the farmer, which is the proportion of horſes or other animals that are requiſite to the extent of land. It is plain that the nature and ſituation of the farm, and the method of huſbandry that is practiſed, muſt have great influence in regulating the number of horſes or oxen that will be neceſſary in its cultivation. It has been obſerved that one team, on a gravelly, ſandy, or other light deſcription of ſoil, will be capable of performing more labour, or of cultivating a greater proportion of land in a given time, than two on ſoils of the clayey kind, where the various operations are greatly retarded by their ſtiffneſs and adheſion. And that where the

* Annals of Agriculture, Vol. XXXV.

† To 10 quarters of oats at 28s. per quarter . . . . £. 14 0 0
To 35 cwt. of hay, at 4l. per ton 7 0 0
To ſhoeing 0 16 0
To chaff 0 15 0
To farriering 0 5 0
To decreaſe in value 2 0 0
To 26 weeks ſummer graſs at 5s. per week . . . 6 10 0
31 6 0

ſituation of the farm is hilly and uneven, a greater ſtrength and extent of team will be requiſite than in the contrary circumſtances, in order to anſwer the purpoſes of tillage. Where, from the nature or locality of the farm, much road-work is to be performed to a diſtance, a more powerful and fuller team will be wanted than in other caſes. The proportion of the graſs or feeding land to that of the tillage is likewiſe to be conſidered, in determining the number of labouring cattle for the farm, as, where the extent of the former is conſiderable, there will be leſs work to be performed, and of courſe one team may be ſufficient where two would otherwiſe have been required*.

On hay- and dairy-farms the teams are generally ſmall, as they require little more than the conveying their different products to the markets, and the carting of manure or ſuch other materials as may be neceſſary in the management of the farms: but as the culture of different ſorts of green crops is neceſſary to the perfect and moſt economical management of the latter, a ſomewhat larger team will, in general, be required. In moſt caſes, from three to four horſes will be ſufficient on ſuch farms, for from one to two hundred acres or even more.

But on perfectly arable farms, eſpecially where the old fallow method of huſbandry is practiſed on one-third or fourth part annually, or on ſuch as are cultivated under the convertible ſyſtem, a much greater extent of team will be required. In the latter caſe, however, and in the former alſo where the improved method of ſubſtituting green crops for fallows is purſued, conſiderable reduction in the number of animals that conſtitute the teams may be made. In the eaſtern diſtricts, it has been common to employ four horſes on farms that contain only forty acres of tillage-land with a ſuitable proportion of graſs. And with ſeventy or eighty acres under the plough, and thirty or more in the ſtate of graſs, ſix horſes have often been employed. And in theſe caſes ſeldom more than two horſes made uſe of as a team. In diſtricts where not leſs than three or four conſtitute a team, the proportion is ſtill higher. But under good management in the improved methods of cultivation a much leſs extent of team may be ſufficient. The buſineſs of forty acres in tillage, with thirty or more in ſward and a few in wood, has been accompliſhed without difficulty by a pair of good horſes. And two oxen with one horſe would in many caſes be adequate to the ſame extent of land. With two horſes and four oxen, the labour of an arable farm of from one to two hundred acres or more may be managed without inconvenience. Some adviſe the uſe of aſs- and mule-teams in ſmall concerns, as

* Synopſis of Huſbandry.

highly economical; the former being hardy and eaſily kept, and the latter capable of being worked to a great age. The ſmall mules are the moſt hardy and uſeful*.

The diſeaſes of horſes are ſo numerous that they cannot be fully conſidered in a work of this nature; but it may be uſeful to the farmer to know a few of the moſt appropriate remedies in thoſe that are the moſt common and moſt frequently occurring in his teams. Theſe are *wounds*, *bruiſes*, *ſprains*, *warbles*, *colds*, *colics*, *ſtaggers*, *ſtrangles*, *jaundice* or *yellows*, *worms*, *botts*, *glanders*, *farcy*, *greaſe*, *mange*, &c.

In common recent wounds, the beſt method of treatment is to bring the ſides of the divided parts immediately into contact, where it can be done, keeping them in that ſituation by ſlips of adheſive plaiſter, as by this means they may be the moſt expeditiouſly healed. Where there is much laceration of the parts, after ſuch of them as can be brought into union have been waſhed and cleaned by a ſoft ſponge, and placed in their proper ſituations, and confined in the manner directed; if on the firſt removal of the dreſſings, which ſhould not be for ſome days, any part remain unhealed, it ſhould be dreſſed with lint moiſtened by the tincture of myrrh, adheſive plaiſter being laid over it. When in the proceſs of healing the granulations of new fleſh riſe above the ſurface, they muſt be kept down by the uſe of blue vitriol once or oftener in the day and proper compreſſes, the other dreſſings being wholly diſcontinued.

If the deſtruction of parts be conſiderable; in order to promote ſuppuration, the application of warm ſaturnine fomentations or poultices may be uſeful. And inflammation ſhould be guarded againſt by bleeding, and the uſe of nitrous maſhes, &c. Where circular bandages can be applied, they will be found uſeful.

Wounds from punctures, as of nails, thorns, &c. may be dreſſed by lint dipped in the tincture of myrrh, and ſecured by adheſive plaiſter; the hair being firſt clipped away; and the ſurrounding parts ſhould be well bathed with a camphorated embrocation.

Greaſy applications of all kinds ſhould be cautiouſly avoided in theſe caſes.

In bruiſes, where the ſkin remains unbroken, the uſe of diſcutient ſaturnine camphorated waſhes is in general the moſt adviſable.

Strains take place in different parts; in the *ſhoulder* they may often be removed by the application of camphorated preparations, as an embrocation compoſed of a pint of camphorated liniment, half a pint of opodildoc and four ounces of Barbadoes tar well mixed together, and made uſe of two or three times a day, after bleeding from the plate vein.

* Annals of Agriculture, Vol. XXXVI.

When in the *knee*, *back-ſinew*, or *fetlock*, much advantage has been found from the application of a cold ſaturnine poultice to the part, and from a flannel roller paſſed round the leg, and kept conſtantly wet with a waſh compoſed of two ounces of crude ſal ammoniac diſſolved in a pint of vinegar, with two quarts of pure water, and two ounces of vinegar of lead.

Warble tumours ariſing upon the backs or ſides of horſes, may be removed with facility by the uſe of ſalt and water, brandy, warm vinegar, or a waſh compoſed of opodildoc and ſpirits of turpentine in equal parts. Where the ſkin has been rubbed off, the compound tincture of myrrh may be uſeful. As tumours and bruiſes of this ſort often ariſe from the ſaddle's not fitting perfectly, by which extraneous ſubſtances are inſinuated, great care ſhould be taken in this reſpect.

Colds, and complaints of that ſort, may be beſt removed, when mild, by reſt, and the uſe of maſhes of bran two or three times a day; and, when more violent, by bleeding, and the giving of balls compoſed of calomel and antimonial powder, each one drachm, powdered nitre one ounce, and treacle ſufficient for making them into a ball, which ſhould be waſhed down with two or three pints of warm oatmeal gruel; the bowels being emptied by means of clyſters. In giving theſe, it is neceſſary to have a large pipe, as much depends upon it. A powder formed of half a drachm of camphor, one ſcruple of antimonial powder, with one ounce each of nitre and aniſeed, has likewiſe been found uſeful.

In colics, when of the ſpaſmodic kind, advantage may often be derived from the uſe of balls compoſed of one ounce and a half of Venice turpentine and one drachm of purified opium, with two drachms of powdered ginger, the bowels being occaſionally cleared by the uſe of clyſters of gruel in the proportion of three or four quarts. Warm gruel, with bruiſed caraway ſeeds boiled in it, may alſo be occaſionally given with benefit.

The ſtaggers is a diſeaſe that is frequently much relieved by bleeding; after which, benefit may be produced by the giving of a ball formed of two drachms of calomel, with an ounce of aloes, and two drachms of powdered ginger, made up with honey. Strong clyſters may alſo be had recourſe to with benefit, and maſhes of bran, oatmeal, or malt, be frequently made uſe of.

In the ſtrangles, after taking away blood in proportion to the ſtate of inflammation, advantage may be derived from the uſe of a powder conſtituted of one ounce of powdered nitre, a drachm of camphor, with half an ounce of powdered aniſeed, given twice a day in a quart of gruel. The horſe ſhould be warmly clothed about the head, and maſhes of bran and oatmeal be frequently given. Saturnine fo-

mentations may be applied frequently warm, by means of flannels, to the tumefied glands; or a bran poultice may be equally effectual;---and much relief may be afforded to the cough, and ſoreneſs of the throat, by having the horſe to breathe through a noſe-bag of ſcalded bran occaſionally for a ſhort time*.

The yellows is a diſorder very common in young horſes, without being attended with fever: in theſe caſes much relief is often afforded by a bolus compoſed of one ounce of powdered aloes, a drachm of calomel, and half an ounce of Venetian ſoap, given every ſecond or third night. And a ball formed of half an ounce of nitre, with an equal quantity of powdered reſin and common ſoap, may be employed with advantage in the intervening mornings. Maſhes and warm water ſhould be plentifully given, and the horſe kept warm by clothing, as well as fully exerciſed†.

Where worms prevail in horſes, whatever the kind may be, great benefit may be produced by a powder compoſed of a drachm of calomel with half an ounce of powdered aniſeed, given in the evening in a little treacle; and in the following morning a bolus formed of an ounce of aloes in powder, with two drachms of powdered ginger and a little treacle; or a powder formed of half an ounce of æthiops mineral, with an equal quantity of crude antimony and aniſeed in powder. With theſe remedies there is little danger of the horſe being injured by cold, or occaſion for any alteration in his food.

In the botts, which are probably produced from the ova of a fly depoſited on the ſkin of the animal during the hot ſeaſon, and thence licked in by the tongue, and taken into the ſtomach, where they are afterwards hatched, and adhere to the inner coat‡, the ſame method of treatment will be found uſeful as in the preceding caſe.

When horſes are diſcovered to be affected with the glanders, they ſhould be ſeparated from the others and confined by themſelves, and care taken that they have no ſort of communication with the others by any means whatever, as the leaſt thing poſſible will communicate the infection: the ſame remedies ſhould then be made uſe of as in colds and ſtrangles.

In the farcy, when the lymphatic ſwellings firſt preſent themſelves about the legs, a bliſtering liniment well rubbed on the parts, as far as the diſeaſe extends, may often be found effectual in removing the diſeaſe. Bleeding to the extent of three or four pints may likewiſe be ſometimes had recourſe to in the early ſtate of the diſorder with ſucceſs. In the more inveterate ſtate of the complaint, advantage has been found from the uſe of balls compoſed of one ſcruple of muriated quickſilver,

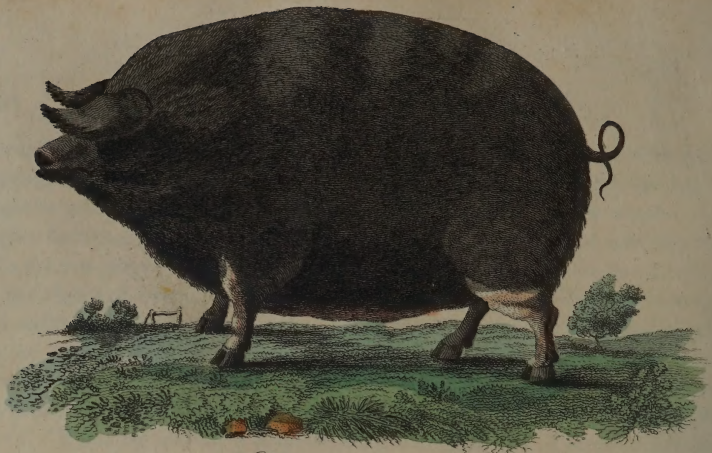
* Denny's Treatiſe on the Diſeaſes of Horſes. † Ibid. ‡ Ibid.

with half a drachm of camphor, and the ſame quantity of purified opium, to which may be added half an ounce of crude antimony in powder, and two drachms of ginger in powder, with honey in proportion to make them up into a ball. And another form that is often beneficial, is that of ten grains of calcined mercury, with half a drachm of camphor and opium, and half an ounce of aniſeed in powder, made up into a ball with treacle. Either of theſe balls may be given every other evening, with maſhes two or three times in the day, to which occaſionally a handful of malt may be added. The water in theſe caſes ſhould be given warm. Rowels may likewiſe be put in the cheſt and thighs when neceſſary. Cordials and a generous diet ſhould be had recourſe to, and warm clothing with gentle exerciſe daily employed. When the diſorder is removed, a ball compoſed of half an ounce of crude antimony, and the ſame quantity of ſulphur and cremor tartar, with half a drachm of oil of aniſeed, may be found very beneficial in reſtoring the animal.

The greaſe is a diſorder that occurs frequently, and which is beſt removed by early attention. In well-fed horſes bleeding may be uſeful to two or three quarts, either from the neck, or the thigh, when local bleeding is preferred. The hair ſhould be cloſely cut from the affected part, which muſt be well waſhed with a ſtrong ſolution of ſoap and water, after which a ſaturnine poultice may be applied warm twice in the day; and when the inflammation diſappears, half an ounce of powdered alum may be added to each poultice, which ſhould be continued for ſix or eight days. Warm maſhes, with an ounce of nitre diſſolved in each, ſhould be given night and morning; and a ball, compoſed of half an ounce of nitre in powder, with an equal quantity of yellow reſin and ſoap, common turpentine being employed to make them up, may be given once a week. Horſes in this ſituation ſhould have gentle exerciſe, with a generous diet, and plenty of ſtable room and clean litter. When the tumefaction ſubſides, preſſure by woollen bandages may be found uſeful. In Lincolnſhire Mr. Cartwright found that common groundſel given to the horſes in the ſtable cured greaſy heels*.

In the mange, after having the parts well waſhed with ſoft ſoap diſſolved in water, they may be anointed with an ointment compoſed of four ounces of ſulphur and two ounces of ſtrong mercurial ointment, with three ounces of hogs-lard, every other day; and a ball formed of half an ounce of æthiops mineral, and an equal quantity of crude antimony and cream of tartar, given every night for ſome length of time†. Great attention is neceſſary to diet, exerciſe, and good grooming. Maſhes with

* Lincolnſhire Corrected Agricultural Report. † Denny on the Diſeaſes of Horſes.



Chinese breed.

Prickear mixed breed.

Berkshire mixed breed.

nitre diſſolved in them are alſo extremely uſeful in this complaint. When the diſeaſe diſappears, the horſes ſhould be turned to graſs if the ſeaſon admits.

Swine. Theſe are a ſort of live ſtock that bring conſiderable profit to the farmer, when proper attention is beſtowed in the breeding, rearing, and other management. The well-formed hog ſhould not be too long, but full in the head and cheek, thick and rather ſhort in the neck; fine in the bone; thick, plump, and full in the carcaſe; full in the quarters, fine and thin in the hide, and of a full ſize in proportion to the kind, with a diſpoſition to fatten well at an early age. The breeds of theſe animals are very numerous, as almoſt every diſtrict is in poſſeſſion of a different ſort. Of the larger kinds the moſt valuable breeds are probably the following:

The *Berkſhire breed*, which is diſtinguiſhed by being in general of a tawny or reddiſh colour; ſpotted with black; large ears hanging over the eyes; thick, cloſe, and well made in the body; legs ſhort; ſmall in the bone; diſpoſition to fatten quickly.

This uſeful breed has extended itſelf from the diſtrict which furniſhes its name, over moſt parts of the iſland. It is the ſort moſtly fattened at the diſtilleries: it feeds to a great weight, and is good for either pork or bacon.

The *Hampſhire breed* of hogs is very large, being longer in the body and neck, but not of ſo compact a form as the Berkſhire; they are moſtly of a white colour, and are well diſpoſed to fatten, coming up to a great weight when properly managed.

The *Shropſhire breed* is another large ſort of hogs, which are found valuable where the keep is in ſufficient abundance for their ſupport. They are not ſo well formed as thoſe of the Berkſhire kind, or equal to them in their diſpoſition to fatten.

The *Glouceſterſhire breed* is likewiſe a large breed, but inferior to either of the above, being tall and long in ſhape, and by no means well formed. The colour is in general white. Mr. Marſhall ſuppoſes this to have been formerly the prevailing breed of the iſland. It is ſuppoſed to be thinner in the ſkin than the Berkſhire breed.

The *Herefordſhire breed* is alſo a large uſeful breed, but without poſſeſſing any advantage over thoſe that have been mentioned.

It is remarked by the author of the Survey of Middleſex, that the largeſt breed in the iſland is ſuppoſed to be kept about Rudgewick on the borders of Suſſex and Surry. They feed to an extraordinary ſize, and weigh at two years old nearly double or treble the uſual weight of other ſorts of hogs of that age. As large breeds pay the farmer the beſt in many caſes, ſuch a breed deſerves to be attended to.

Among the ſmaller breeds of theſe animals there is much variety.

The *Chineſe breed* is diſtinguiſhed by the neck being thick; the body very cloſe, compact, and well formed; the legs very ſhort, and the ſize ſmall; the fleſh delicate; the colour various, as white, brown, and tawny. This breed is particularly diſpoſed to fatten in an expeditious manner, and has, in conſequence, ſpread over a great part of the kingdom. It is the moſt adapted for being uſed as pork, but is much too ſmall for being cured as bacon.

Another breed of the ſmall kind of hogs is met with in many diſtricts; it is of a white colour, thick, compact, and well made in the body; ſhort in the leg; the head and neck well formed, and the ears ſlouching a little downwards. It is well diſpoſed to fatten, and perfectly hardy.

The *Swing-tailed breed* is an uſeful ſort of the ſmaller kind of hogs, being hardy in its nature, and of conſiderable weight in proportion to its ſize.

Some farmers prefer mixed breeds, as being more beneficial than either the large or ſmall perfect breeds. Where this is the caſe, the Berkſhire, with a croſs of the Chineſe, has been found a very profitable ſort, as being capable of feeding to a conſiderable weight with a moderate proportion of food.

In order to have hogs of the moſt perfect kinds, the ſame attention ſhould be paid in the breeding of them as in other ſorts of animals, by ſelecting the moſt perfect and beſt-formed males and females of the ſeveral breeds, and carefully raiſing the ſtock from them. Thoſe intended to be kept as ſows and boars ſhould be conſtantly well fed from the firſt, as, where they are pinched for food, they are never ſo fine or healthy afterwards.

The breeds of hogs, like thoſe of other animals, ſhould be provided according to the nature of the keep. Where it is abundant, or cultivated ſolely for the purpoſe of the raiſing of pigs, the large breeds will moſtly be found the moſt advantageous, as the difference in the proportions between the living and the dead profitable weight, is ſaid by ſome to be always the leaſt in the largeſt-ſized animals*.

It is of the utmoſt importance in the management of ſwine, both in the view of economy in the labour of their attendance, and the raiſing of a large proportion of manure, as well as the advantage of the hogs, to have convenient ſtyes or piggeries. The methods of conſtructing theſe, with the greateſt advantage in theſe different reſpects, have been deſcribed. It is remarked by Mr. Young, that a piggery "muſt be in a circle, or it muſt fail in convenience. In the centre, the boiling- or ſteaming-houſe, with a granary for corn, meal, bran, &c.; a range of ciſterns in diviſions around

* Knight in Communications to the Board of Agriculture, Vol. II.

PLATE XXXIV.

Machine for weighing Live Stock.

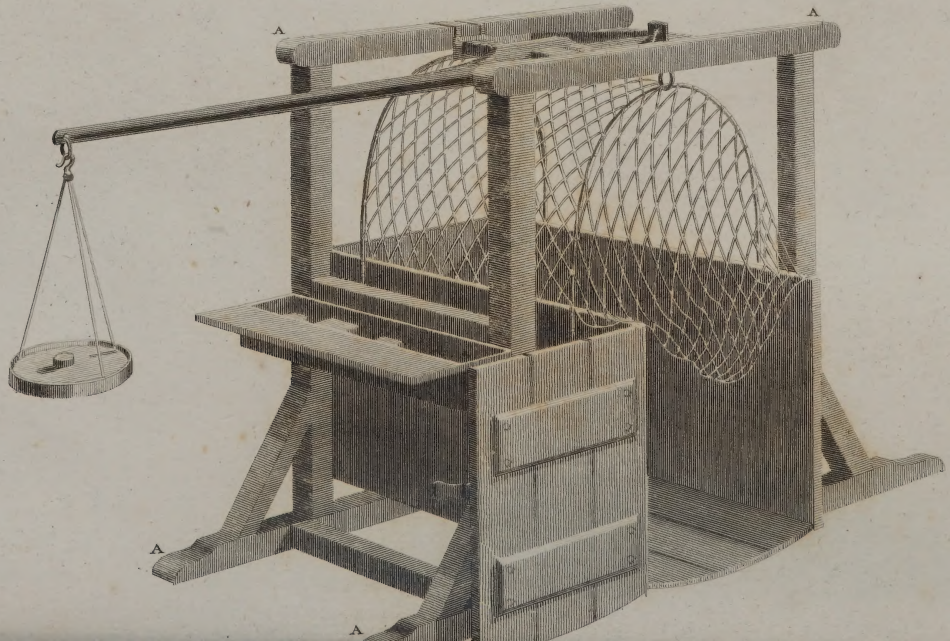
[*To face Page* 1192, *Vol. II.*]

THIS machine is conſtructed on the principle of the common ſteel-yard.

A A A A, a ſtrong wooden frame, with ſteel centres, in which the pivots of the lever are hung.

On the ſhort ſide of the lever is ſuſpended a coop, ſurrounded by ſtrong net-work, in which the animal intended to be weighed is placed; the point of ſuſpenſion is connected with the coop by means of two curved iron rods, which at the ſame time form the head to the ſame; a common ſcale is hung on the longer ſide of the lever. By this contrivance any ſmall animal may be very eaſily and expeditiouſly weighed, and at the ſame time with a ſufficient degree of accuracy.

MACHINE FOR WEIGHING LIVE STOCK.



it, for receiving immediately from the copper or ſteam apparatus, and alſo by tubes from the granary; around theſe a path, then the fence, wall or paling, in which the troughs, with hanging lids, for ſupplying food directly from the ciſterns on one ſide, and for the hogs feeding on the other; a range of yards next, and another of low ſheds beyond; and laſt of all, the receptacle for the dung. The potatoe ſtores (*pyes* as they are called) ſhould be at one end or point near to the entrance, and water muſt be raiſed to the coppers and ciſterns at once by a pump; a trough or other conveyance from the dairy to the ciſterns, for milk, whey, &c. Such an arrangement will be very convenient, and the expenſe need not be conſiderable. To annex a certain ſpace of graſs, or artificial graſſes, in diviſions, into which the hogs may be let at pleaſure, is an addition of admirable uſe if the ſpot permit it. Thoſe who do not poſſeſs a convenient pig-apparatus, can have little idea of the great uſe of it in making manure. This alone becomes an object that would juſtify any good farmer in going to a certain expenſe, for attaining ſo profitable a part of what ought to be his farm-yard ſyſtem. In nine-tenths of the farmeries in the kingdom, it is lamentable to ſee ſo many parts of a right piggery ſcattered and unconnected, in ſuch a manner as to preclude convenience, increaſe labour, and prevent the making of dung*."

* In a hoggery, built by the author in 1765, nearly, but not exactly, on this idea, the expenſes were as below:

	£.	s.	d.
The boiling-houſe	18	18	0
Copper	13	0	0
Pond	4	0	0
Pump	1	10	0
Ciſterns	14	0	0
Shed	6	15	0
Paling	7	7	0
Paving	10	0	0
Troughs	3	0	0
Total, beſides timber,	£. 78	10	0

By means of one of theſe yards he fattened eighty-eight hogs in ſpring 1766 with only one man to attend them; whereas three would not have been ſufficient without ſuch conveniences. They were littered with nine loads of ſtraw and haulm that coſt 6l. 18s.; and this made ninety loads of very rich dung, valued by ſeveral farmers on the ſpot at 5s. a load.

	£.	s.	d.
Value of dung at that rate	23	10	0
Straw, &c.	6	18	0
Profit in dung,	£. 16	12	0

It is added that, " with ſuch a convenience, all the peaſe, beans, barley, buck-wheat, potatoes, parſnips, carrots, &c. that are or can be raiſed on a farm, may be applied to the rearing, feeding, or fattening hogs; by which means the farmer has the opportunity of improving his land to the higheſt degree, and at the cheapeſt rate poſſible."

The ſow is capable of propagating at ſeven or eight months old; but it is better to defer her taking the boar till ten or twelve months, as ſhe becomes more ſtrong and affords better litters of pigs. The period of being with young in the ſow is about four months, and the uſual produce from about eight to ten or twelve in the large, and more in the ſmaller breeds, which in general bring the greateſt number, and the moſt early. The boar ſhould be a year old or more before he be put to the ſows, as by this delay he attains a better growth, and is more vigorous.

As there is great difficulty and expenſe attending the rearing of young pigs in cold ſeaſons, the farmer ſhould contrive as much as poſſible to have his litters early in the ſpring and autumn ſeaſons, as about the beginning of April and the latter end of Auguſt or beginning of the following month, as at theſe periods much leſs loſs will be ſuſtained in the death of the pigs, and leſs expenſe incurred in food. The litters which are pigged in June, or the early part of the following month, ſhould always be reared, as being highly profitable. But it is ſeldom adviſable to keep the late autumn litters, as the cold in the winter is almoſt ſure to deſtroy many of them.

When ſwine are made an object to the farmer, great care ſhould be taken to have a good boar conſtantly along with the ſows, in order that a proper ſucceſſion of young pigs may be produced. By this means the ſows are likewiſe induced to take the boar ſooner than would otherwiſe be the caſe.

In the management of hogs it is of great conſequence to keep the different

But it is obſerved that they had not half the litter they ought; or they would have made 35l. worth of manure, beyond doubt.

Ninety loads coſting 6l. 18s. is 1s. 6d. per load.

" Theſe particulars, ſurely (ſays he) muſt prove the vaſt importance of ſuch conveniences for fattening great numbers of ſwine, for the mere purpoſe of raiſing manure. Suppoſe the expenſe, timber included, to be 110l. and the intereſt called 5l. what compariſon is there between the expenſe of 5l. a year, and the prodigious utility of having it always in your power to fatten, with ſcarce any expenſe of labour, whatever number of hogs you pleaſe?

" The total expenſe at preſent of ſuch yards would not be leſs than 150l.; and if made conformably to the more correct idea, would be 200l. or 250l. But the governing idea of poſition ſhould be followed in ſtyes of 20l."

ſorts ſeparate and diſtinct from each other, as the ſows in pig, thoſe with pigs, and the ſtores according to their ages. It is only in this way that they can be kept to the moſt advantage. At the time of pigging it is neceſſary alſo that each ſow ſhould be kept in a ſeparate ſtye, in order that there may be no interruption or diſturbance from the others coming about her. About this period, likewiſe, more than ordinary attention ſhould be beſtowed on the ſows, and the ſtyes kept but thinly littered, in order that accidents may be avoided.

As the breeding of pigs is a buſineſs that affords the farmer a conſiderable profit and advantage in various views, it is of eſſential importance that he be provided with ſuitable kinds of food in abundance for the ſupport of the numerous ſows that it will be neceſſary for him to keep, and the great number of pigs that muſt be raiſed. Upon this being properly and effectually done his ſucceſs and advantage will in a great meaſure depend. The crops capable of being cultivated with the moſt benefit in this intention are beans, peaſe, barley, buck-wheat, potatoes, carrots, parſnips, Swediſh turnips, cabbages, lettuces, clover, lucerne, chicory, &c. The proportions in which theſe crops ſhould be grown for this purpoſe muſt vary according to circumſtances; as the kind of hogs, their extent, and the manner of diſpoſing of them: but whatever number may be kept, an equal proportion of root crops and thoſe of the graſs kind will be requiſite, with about half as much of thoſe of the farinaceous or grain kind as of thoſe of the root ſort; and a quantity of the luxuriant vegetable kind, fully in proportion to the number of hogs that are to be fed on ſuch ſorts of food.

In the ſupplying of the hogs with food a diſtinction is likewiſe to be made according to the different kinds, in order that the moſt may be made of the food. The ſows conſiderably advanced in pig, and thoſe with pigs, ſhould be fed in a better manner than the ſtore pigs. The former ſhould be ſupplied with good waſh twice or oftener in the day, and have a ſufficient allowance of cabbages, potatoes, carrots, or other ſimilar vegetables, ſo as to keep them in good condition; which is ſhown by the gloſs of their coats. The ſows with pigs ſhould be kept with their litters in ſeparate ſtyes, and be ſtill better fed than thoſe in pig. Where dairying is practiſed, the waſh of that kind which has been preſerved for the purpoſe while the dairying was at the height, in brick ciſterns, conſtructed for receiving it from the dairy, muſt be given them, with food of the root kind, ſuch as carrots, parſnips, potatoes and cabbages, in as large proportions as they will conſume them, in order that the pigs may be properly ſupported and kept in condition. But where the buſineſs of dairying is not carried on ſo as to provide waſh of that ſort, meal of ſome kind or

other muſt be had recourſe to for the making of waſh, by mixing it with water, which, in the ſummer ſeaſon, will be ſufficient for their ſupport; and in winter it muſt be blended with the different ſorts of roots prepared by boiling, or, when for the young pigs, with oats and pea-ſoup *. With this ſoup and dairy-waſh, where proper attention is beſtowed, young pigs may be weaned and reared in the winter ſeaſon even with profit and ſucceſs. The pea-ſoup is an admirable article when given in this intention: it is prepared by boiling ſix pecks of peas in about ſixty gallons of water, till they are well broken down and diffuſed in the fluid; it is then put into a tub or ciſtern for uſe. When dry food is given in combination with this, or of itſelf, Mr. Young adviſes oats, as being much better than any other ſort of grain for young pigs, barley not anſwering nearly ſo well in this application. We have employed oats coarſely ground for young hogs with the beſt ſucceſs, both in the form of waſh with water and when made of a thicker conſiſtence.

Where the ſows and pigs can be ſupported with dairy-waſh and roots in the manner juſt mentioned, there will be a conſiderable ſaving made by avoiding the uſe of barley-meal, peaſe, or bran and pollard. It is therefore highly diſadvantageous to the farmer to have recourſe to ſuch ſubſtances in theſe circumſtances.

There is another point to be particularly regarded in the management of ſows and pigs, which is that of keeping them conſtantly well littered down with clean ſtraw or ſome other ſimilar article, as by this means they are kept perfectly clean and healthy, and at the ſame time a large quantity of manure is afforded.

In the practice of cultivating crops of various kinds purpoſely for the food and ſupport of ſwine, the ſows and ſtore pigs will of courſe be ſupported during the winter ſeaſon, as from the beginning of November to the middle or latter end of May, by the various roots that have been ſtored in this view, ſuch as potatoes, carrots, parſnips and Swediſh turnips; alſo cabbages in their freſh ſtate, in combination with the preſerved dairy-waſh, and other articles that have been noticed above. At the latter of the above periods the whole of the hogs in the yards ſhould be looked over and ſorted; ſuch as have attained half or more of their growth being drawn and turned upon the clover, lucern, or chicory crops, where they ſhould be kept till towards the latter end of September, the fences being kept in perfectly good order, and ponds or other places provided for the hogs to drink at. Under this management they are found to grow rapidly, the food in general agreeing well with them, and they are then taken up in excellent condition for being fattened. In this practice the important difference from the former method is in ſelecting the ſuf-

* Young's Farmer's Calendar.

ficiently-grown hogs from the ſows that have pigs and the weaned pigs, and only leaving the latter to be fed with the dairy or other waſh, with ſuitable green food, ſuch as lettuces, cabbages, tares, &c. by which a much larger ſtock of breeding hogs may be kept*. The tares and cabbages may be uſed for the ſows that have ſpring litters, and the lettuces for thoſe that have autumn litters. In the cultivation of this plant in this intention, Mr. Young directs that the land ſhould be well manured, and brought into a very fine clean ſtate by being ploughed in the cloſe of the year into ridges of a ſuitable ſize for the drill machine, being ſcuffled over in February and again in March; then well harrowed, which ſhould be again repeated before drilling, which muſt now be performed in the proportion of from half an acre to an acre, according to the extent of hogs that are kept. The rows muſt be equidiſtant, at about one foot aſunder; and in order to have a proper ſucceſſion of theſe plants more ſhould be put in in April or later. The crops muſt be kept conſtantly well weeded, and thinned in the rows by hand, to the diſtance of about nine or ten inches, as if this be neglected the plants are drawn up weak and poor, never ſucceeding well. At the time they are ſix inches high, they ſhould be horſe-hoed with a ſcarifier, or ſcuffler, with the hoe four or at moſt five inches in width.

Theſe plants are of excellent uſe for ſows and pigs, promoting the increaſe of milk in a great degree; they afford great aſſiſtance where the dairies are ſmall, and in all caſes tend to prevent the conſumption of grain, which is of great importance in hog-management. From the ſweet and ſaccharine quality of the plant, the hogs are not only extremely fond of it, but it becomes highly nutritious. By theſe means the ſwine will be well ſupported and carried forward till the time the ſtubbles are cleared, when they may be turned upon them, and thus the whole year be provided for in theſe different ways.

But though this ſyſtem of management is advantageous, that of ſoiling the hogs in their yards with green food, cut freſh in the way that has been already directed, is conſidered by Mr. Young, notwithſtanding the increaſed expenſe that attends it, and the waſte of a certain portion of the food, as highly preferable on account of the vaſt ſtore of manure that may be raiſed. But it cannot be attempted with propriety unleſs the farmer be provided with abundance of ſome ſort or other of materials for the purpoſe of litter, and ſubſtances of the peaty or earthy kinds for the purpoſe of covering the floors of the hog-yards, in order to abſorb and prevent the waſte of any portion of the liquid matters that may fall upon them. In this method of proceeding, clover, chicory, tares, and lucern, are the kinds of food that are moſt

* Young's Farmer's Calendar.

commonly employed; but there are others that may be brought in to their aſſiſtance when neceſſary, eſpecially on the ſtronger ſorts of lands, ſuch as beans eaten green, which afford a large quantity of food in proportion to the land they occupy, the whole ſtems being conſumed; and cabbages may likewiſe be had recourſe to for the ſummer as well as winter food of theſe animals. It is recommended by Mr. Young, that the yards of the hog-ſties ſhould have gates ſufficiently large for bringing in carts loaded with the different articles of both food, floors, and litter, as well as for removing the manure that is made.

In this management, inſtead of a few ſows only being kept, as was uſual in combination with the dairy ſyſtem, great numbers may be maintained, and a great many young pigs be raiſed. But in order to derive the greateſt advantage from this ſyſtem of hog-management, Mr. Young thinks it ſhould as much as poſſible be ſo contrived that the ſows only pig twice in the year, as has been mentioned above; as by this means there will "never be a long and expenſive ſeaſon for rearing the pigs before they are put to the ſtaple food of clover or potatoes, &c. But this circumſtance is much removed by the proviſion of crops raiſed expreſsly for ſwine."

In this ſcheme of keeping ſwine, the ſales for lean hogs ſhould, he obſerves, annually take place in October, the litters of April being then diſpoſed of as ſtores, and thoſe of Auguſt kept till the ſame period in the following year, in order to be ſold as baconers, when none are fattened on the farm.

The expenſe of keeping all ſorts of ſtore-ſwine muſt obviouſly vary conſiderably according to the convenience of procuring their food, and the excellence of the management that is purſued. In ſuckling-ſows it has been eſtimated upon the average at from eighteen pence to three ſhillings the week, and while in pig at from one ſhilling to eighteen pence; weaned pigs at firſt from one ſhilling and ſixpence to two ſhillings and ſixpence per head, and afterwards till they are become fully grown at from one to two ſhillings each per week. Such calculations muſt, however, be liable to differ greatly in different caſes.

The breeding of pigs is a ſyſtem that deſerves the farmer's attention, not only as obtaining his pig-ſtock at a much cheaper rate than by purchaſing at the markets, but as being certain of having them more healthy and well fed, conſequently ſuch as will anſwer much better in their growth and fattening afterwards.

The fattening of hogs is a buſineſs uſually performed at two different ſeaſons of the year, as in October and in February or March: the former is, however, the moſt principal period. In this management various ſubſtances have been recommended; but thoſe moſt commonly employed are ſome ſort of farinaceous

material, with ſkimmed milk, and dairy or other kinds of waſh. For the ſmaller ſorts of fattening hogs, coarſely ground oats mixed with theſe waſhes are excellent. Barley meal and pollard are likewiſe frequently made uſe of for the purpoſe with much ſucceſs. The meals of peaſe and beans, when given in ſufficient proportions for the purpoſe of fattening, are apt to heat them too much, and produce a difficulty of breathing; but for the large or full-grown hogs, pea-meal or peaſe unground are probably the beſt material that can be made uſe of. A portion of bean meal, or whole beans, may likewiſe be given occaſionally with advantage, as both theſe articles contain a much larger proportion of nutritious matter in the ſame bulk than any ſort of grain, and are more laſting in their effects on the ſyſtem, from their undergoing the proceſs of digeſtion more ſlowly, perhaps on account of their containing a larger proportion of oil in their compoſition *. Malted barley given whole has likewiſe been found highly beneficial in the fattening of hogs, the quantity of ſaccharine nutritious matter being thus greatly augmented †. Acorns in the ſame ſtate have likewiſe been found to fatten hogs, but they cannot be depended on as a food for this uſe. Potatoes and carrots have alſo been occaſionally tried in the ſame application; but as they never anſwer well without being boiled and combined with the meal of ſome ſort of grain, it is a much better and more economical practice to convert them to the purpoſe of ſtore feeding, and depend upon farinaceous ſubſtances for fattening. The various experiments of Mr. Boys of Kent, detailed in the twenty-ninth volume of the Annals of Agriculture, ſufficiently ſhow the diſadvantage of this method. Even when the potatoes were boiled and blended with barley-meal, he ſuſtained conſiderable loſs in this mode of fattening. There is, however, another method of fattening, which, in particular ſituations, may be practiſed with profit and ſucceſs, which is that of employing the waſh of large diſtilleries with grains and ſome ſort of meal. In the firſt parto f the fattening the grains and waſh are given, and in the latter the meal ‡.

The quantity or weight of pork produced by a given quantity of peaſe, beans, meal, or other materials employed in the fattening of hogs, has not been well aſcertained, and it is probable that a great deal will depend upon the ſize, breed, and diſpoſition to fatten; but, judging from the value of the animals before and after they have been fattened, it is concluded by Mr. Knight, that a Wincheſter buſhel of the firſt of the above articles may add about nine or ten pounds to the weight of a good hog of twenty ſcore, or perhaps ſomething more upon a larger, and conſi-

* Darwin's Phytologia. † Synopſis of Huſbandry.
‡ Annals of Agriculture, Vol. XXIII.

derably leſs on one of a ſmall ſize *. A hog put up to fatten in good condition, and they ſhould never be put up in the contrary ſtate, which when fat will weigh twenty ſcore, will conſume in the proportion of ſix or ſeven buſhels of peaſe †.

In regard to the method of giving the different materials that are employed in the fattening of ſwine, there are different opinions entertained; ſome contending that they ſhould be uſed as much as poſſible in a ſolid form, waſh, as drink, being occaſionally uſed; while others prefer the contrary method as the moſt beneficial: as in the latter mode there will be leſs time taken up by the hogs in feeding, and of courſe more left for them to ſleep and reſt in, as well as more economy in the food and the labour of giving it, it is probably the moſt adviſable. It has indeed been obſerved by Mr. Young, in his excellent Calendar of Huſbandry, that "the moſt profitable method of converting corn of any kind into food for hogs is to grind it into meal, and mix this with water in ciſterns, in the proportion of five buſhels of meal to one hundred gallons of water, ſtirring it well ſeveral times a day for three weeks in cold weather, or for a fortnight in a warmer ſeaſon, by which it will have fermented well and become acid; till which time it is not ready to give." This mixture ſhould always "be ſtirred immediately before feeding," and "two or three ciſterns ſhould be kept fermenting in ſucceſſion, that no neceſſity may occur of giving it not duly prepared. The difference in profit between feeding in this manner, and giving the grain whole or only ground, is ſo great, that whoever tries it once will not be apt to change it for the common methods." It is added that "peaſoup is an excellent food for hogs, and may, though he has not ſufficiently compared them, equal the above, eſpecially if given in winter, milk warm." But wherever food is prepared by heat, the expenſes of fuel and labour are a great drawback on the profits of the ſyſtem. It ſhould therefore be well conſidered before it is undertaken. But in whatever way the food be given, great care ſhould be taken that the hogs have a full allowance at ſufficiently ſhort intervals to keep them conſtantly in a ſtate of reſt, as it is on this principle that they become fat in an expeditious manner. It is a fact frequently obſerved in fattening hogs, that they pay better for their keep in the latter part of their fattening than in the former; which probably ariſes in ſome meaſure from their not being fed in a ſufficiently full manner, or with ſufficient frequency in the beginning, ſo as to keep them in a ſtate of reſt.

The length of time that is neceſſary in fattening theſe animals muſt vary much according to the ſtate in which they are put up, their ſizes, and the differences in

* Communications to the Board of Agriculture, Vol. II. † Ibid.

their diſpoſitions to fatten, but in general from five or ſix weeks to two or three months is ſufficient.

In the time of fattening, it is likewiſe of great importance to keep the hogs clean and warm, by having them frequently well littered down, as by this means they not only fatten more quickly, but the moſt manure poſſible is raiſed. The advantage of warm ſties, with warm food in cold weather, has been found very conſiderable.

It is the beſt method to have the pigs caſtrated while young. The male pigs are uſually gelded at about three weeks old without danger, and the female ones may be cut or ſpayed when a month old; though, in the latter caſe, the operation is frequently performed at a much later period. The ſows, when not wanted for the purpoſe of breeding, may alſo be ſpayed: this buſineſs is moſtly done by perſons who are in the conſtant practice of it.

It is abſolutely neceſſary to keep all ſorts of ſwine conſtantly well ringed, in order that they may lie quietly in the ſties, and of courſe thrive better.

A great miſtake ſeems to have been committed by farmers in the management of hogs, from the ſuppoſition that they can only be kept with profit in ſo far as they may conſume the materials that would otherwiſe be waſted. There cannot, however, be any doubt but that ſwine will pay for their keep as well as any other ſort of live ſtock, where a judicious ſyſtem of cultivating crops purpoſely for them is purſued. This is fully ſhown by the various ſtatements that have been made on the ſubject.

There are different ways of curing the fleſh of hogs, according to the intention for which it is deſigned. When cured as bacon, it is the practice in Kent to ſinge off the hairs, by making a ſtraw fire round the hog, an operation which is termed *ſwaling*. "When the flitches are cut out they ſhould be rubbed effectually with a mixture of common ſalt and ſaltpetre, and afterwards laid in a trough, where they are to continue three weeks or a month, according to their ſize, keeping them frequently turned; and being then taken out of the trough are to be dried by a ſlack fire, which will take up an equal portion of time with the former; after which they are to be hanged up, or thrown upon a rack, there to remain till wanted."

In the making of bacon on the continent, it is frequently the cuſtom to have cloſets contrived in the chimneys, for the purpoſe of drying and ſmoking them by means of wood fires*.

Another method of curing this ſort of meat is that of ſalting it down for pickled pork, which is far more profitable than bacon. After the hog is cleanſed of the

* Bradley on Huſbandry and Gardening.

hair, and the head taken off, together with the legs and hands, and the necks, loins, and all the lean bones cut out, which will amount to nearly two-thirds of the whole hog, the remaining part, which is the fat or prime pork, is to be cut into pieces of a ſize proportioned to the circumference of the ſalting-tub, and every piece rubbed on each ſide and on every part with common ſalt, having ſome beaten ſaltpetre ſprinkled on each. The bottom of the tub ſhould alſo be covered with ſalt, and when the pork is ſufficiently powdered, the pieces laid in, with the rind upwards, and every one preſſed down with all the ſtrength that can be uſed, and wedged in ſo cloſe as to leave no apparent chaſms. Over this layer is to be ſpread a covering of ſalt, with a very ſlight ſprinkling of ſaltpetre, as too much makes it hard. In about a month or five weeks the brine will begin to riſe, and, in a ſhort time afterwards, cover the whole ſurface of the tub; but if, from a defect in the ſalt, it ſhould fail to diſſolve into brine within that period, it will be neceſſary to make a quantity of brine and pour over the pork; for unleſs the whole be covered with brine it will not keep well. In adding the brine care ſhould be taken not to diſturb the pieces of pork.

In the curing of hams in Weſtmoreland, the method purſued is this: They "are firſt rubbed very hard, generally with bay-ſalt; by ſome they are covered cloſe up, by others they are left on a ſtone bench to allow the brine to run off. At the end of five days they are again rubbed as hard as they were at firſt, with ſalt of the ſame ſort, mixed with rather more than an ounce of ſaltpetre to a ham. Having lain about a week, either on a ſtone bench, or in hogſheads amongſt the brine, they are hung up by ſome in the chimney amidſt the ſmoke, whether of peats or coals; by others, in places where no ſmoke ever reaches them. If not ſold ſooner, they are ſuffered to remain there till theweather becomes warm." They are then packed in hogſheads with ſtraw or oat-meal ſeeds, and ſent to the places of ſale. It has been found by experiment that hams loſe twenty per cent. of their weight in the curing*.

Swine are ſubject to a variety of diſeaſes, but few of them have yet been ſufficiently inveſtigated to aſcertain the proper means of cure. Much expoſure to cold is liable to bring on affections of the lungs, by which the animals gradually decline and waſte in fleſh, having a frequent huſky dry ſort of cough. Warmth, with good keep of the leſs dry and heating kinds, would ſeem to be the moſt advantageous method of removing ſuch complaints.

When hogs become affected with the mange, care muſt be taken to ſeparate them from the reſt; and after being well waſhed in ſoap and water, they ſhould be

* Corrected Report of Weſtmoreland.

anointed with an ointment of the ſame kind as that recommended for the ſame diſeaſe in ſheep. A little common ſulphur ſhould likewiſe be given in their food.

In large lop-eared hogs the parts behind them are apt to crack and become ſore in hot ſeaſons; in theſe caſes they ſhould be anointed with a little ſaturnine ointment.

When the udders of the ſows take on hard lymphatic ſwellings, which is ſometimes the caſe, attempts may be made to remove them by the uſe of camphorated ſaturnine waſhes or ointments, care being taken to have the parts clean wiped before the pigs are admitted to ſuck. In ſuch caſes half a drachm of calomel may likewiſe be exhibited every ſecond or third night for two or three nights.

Rabbits.—This is a kind of live ſtock that can only be employed with profit by the farmer in particular ſituations, and under certain circumſtances. Wherever land is capable of producing tolerable crops of either grain or graſs, the ſyſtem of rabbit-warrens can ſeldom, if ever, be eſtabliſhed with advantage. The hazard and uncertainty of rabbit-management is conſtantly ſo great, that it is ſafer for the farmer to depend upon even moderate crops of either of the above kinds than this. It is only the light barren ſandy ſorts of land, in ſuch declivities and other ſituations as cannot be brought under the plough, and which cannot be converted to the purpoſe of paſture for even ſheep, which is in general the proper application of ſuch lands, that rabbit-huſbandry is proper to be undertaken upon.

The breeds of this animal are various; but thoſe chiefly employed in warrens are moſtly either the *common gray breed* or the *ſilver gray breed*; the former is moſt valuable in regard to hardineſs and fleſh, but the latter in reſpect to ſkin. The fur of the firſt ſort, which is the moſt prevalent, is chiefly employed in the hat-manufactories; while the ſkins in the latter caſes are in common dreſſed as furs for the China market, and are in general nearly double the value of thoſe of the other ſort.

This ſort of ſtock, when turned into the land intended for the warren, ſoon provide themſelves habitations, by preparing holes and burrowing in the more dry, light, ſandy, and elevated parts, where they ſafely lodge and propagate their young.

In ſome warrens in Lincolnſhire, they ſtock in the proportion of three couple to the acre, but in other caſes conſiderably more. One buck is ſufficient for a hundred does.

It is neceſſary to have the warrens well incloſed; not only for the purpoſe of preventing the ſtock from ſtraying and being deſtroyed, but to prevent their being annoyed by different ſorts of vermin. This is effected in different methods, according to circumſtances, as by walls or paling; but, from the great expenſe of theſe fences, more commonly by ſod, earth, and turf mounds, or banks and fences coped

or kidded on the top by furze, thorns or other ſorts of bruſh-wood. This fencing, with that of nets and traps, conſtitutes the great expenſe of rabbit-huſbandry; which, when added to thoſe of charcoal for drying the ſkins, warreners, men for killing and carrying, horſe-hire, &c. is very conſiderable.

Beſides this, though rabbit-ſtock demands, on the whole, but little regard, in ſevere winter ſeaſons it is neceſſary to provide them with additional food, ſuch as hay, turnips, clover, ſaintfoin, and other ſimilar kinds, to be diſperſed about in the warrens. Turnips are the beſt ſort of food in ſnows, as the rabbits can find them by the ſcent. From two to three large cartfulls will be ſufficient to fodder a thouſand couple or more a day. One load of hay may be ſufficient for a day in ſtorms. In ſome diſtricts, billets of new cut wood aſh boughs, gorſe, &c. are diſtributed; the bark and other parts of which are conſumed, and the quantity of hay by that means greatly diminiſhed. There are likewiſe other expenſes, in clearing away ſnow from the fences, to prevent their eſcaping, and in the deſtroying vermin, as well as for night-watching.

The rabbit begins to breed at eight, ten, and twelve months old, and goes about thirty days with young, which are about twenty-two days more before they appear from the burrows, being ſuckled during that time twice a day by the mother; of courſe they may breed three or four times in the courſe of the year when very well fed, as they are known to take the buck again very ſoon; but in incloſed warrens they rarely breed more than twice in the year. The annual ſale of produce is in general eſtimated at from three to eight couple per acre, affording a profit of eight or ten ſhillings, or more under good management*. The produce is the greateſt on new land†; but much in reſpect to profit muſt depend upon ſituation, as when it is near to large towns, where there is a conſtant demand for the rabbits as food, it muſt be greater than in other caſes. They are in ſeaſon from the beginning of November tillthe commencement of the enſuing year, during which period the prime ſkins are afforded; therefore the greateſt part muſt be killed in this ſhort interval. There is annually a great loſs in what are termed *half ſkins*, *quarter ſkins*, *and racks*, ſixteen of which are only allowed for as one whole ſkin. Rabbits are ſold by the hundred, ſix ſcore couple making the hundred‡.

* Young's Agricultural Survey of Lincolnſhire. ‡ Ibid.

† The following eſtimate of the warren on the eſtate at Thoreſway, is given by Mr. Young on the authority of Mr. Holdgate, the tenant, who ſtates the expenſes of 1700 acres under the ſilver ſort of rabbits, thus:

They are taken either by means of nets or traps. In the former method the nets are ſet in the form of a fold, between the burrowing places and the feeding grounds, in the night or early in the morning; the rabbits being hunted into them in their return from feeding.

	£.	s.	d.
Labour, three regular warreners, with extra aſſiſtance at killing	85	0	0
Fences	42	10	0
Winter food	42	10	0
Nets, traps, &c. &c.	14	3	4
Delivery	21	5	0
Rent is ſaid to be 7s. an acre	595	0	0
	800	8	4
The capital employed is that ſum, with the addition of ſtock paid for; ſuppoſe this, as ſtated above, 3 couple an acre, at 2s. 4d.	595	0	0
	1395	8	4
Intereſt of that ſum one year, 5 per cent.	69	5	0
	1464	13	4

Annual Account.

Expenſes as above	800	8	4
Intereſt	69	5	0
	869	13	4
Produce 10,000 couple, at 2s. 4d.	1166	13	4
Expenſes	869	13	4
Profit	297	0	0

or 24l. per cent. (the five per cent. included) on capital employed. "This is (Mr. Young obſerves) very great, reckoned on the capital, but ſmall reckoned by rent, as it amounts to only half a rent. But ſuppoſe the groſs produce of 1500l. which he takes to be nearer the fact; then the account will ſtand thus:

Produce	1500	0	0
Expenſes	869	0	0
Profit	631	0	0

or 47l. per cent. on the capital.

"Take it how you will, he thinks it explains the reaſon for ſo many of theſe nuiſances remaining. The inveſtment of a ſmall capital yields an intereſt that nothing elſe will; and thus the occupier will be ſure never to convert them to better uſes. But what ſays the public intereſt? Here are only 200l. expenſes to 600l. rent; what is the population, the induſtry, the improvement! The landlord gets the loweſt of rents, the tenant makes a good profit; they divide all, and the reſt of the world are little the better for them."

The traps are conſtructed by forming large pits dug in the way of their moſt frequented tracks, and covered by a ſort of folding door, towards the centre of which is a ſort of ſmall trap door, to which they are led by a narrow track or meuſe. The rabbits, being thus taken, are ſorted according to circumſtances.

A very great objection to theſe animals is their deſtroying the corn, new ſown graſſes, turnips, and even the quick hedges that are in the vicinity of them.

In raiſing tame rabbits, the principal points to be regarded are thoſe of having ſuch ſtock as is perfectly free from diſeaſe, keeping them quite clean, dry, and free from all ſorts of filth, with a ſufficient protection from cold in ſevere weather. The feeding ſhould be performed regularly, in ſmall quantities at a time, and a due proportion kept up between the dry and moiſt green vegetable food: the moſt proper kinds of each ſort of which are, thoſe of clover, parſley, endive, dandelion, cabbage-leaves, carrot-tops, &c. with good green rouen or clover-hay, pea-chaff, oats, pollard, and bran. They uſually breed at the age of ſix months, and moſtly three or four times in the year, eſpecially when kept ſufficiently warm in the winter ſeaſon; at this time a little dry hay ſhould be placed in the hutch: the young may be weaned at ſix or eight weeks old, and the buck admitted. The young rabbits ought to be carefully ſeparated when they become of any ſize, and never be ſuffered to be in any degree crowded together, as in ſuch caſes they ſoon become diſeaſed.

Poultry.—This is a ſpecies of ſtock which, from the trouble and uncertainty that attends it, is of doubtful advantage, except in particular ſituations and circumſtances. The term poultry comprehends ſeveral different ſorts of birds that have been conſidered as ſtock for the farm-yard.

Common Fowls.—Of theſe there are various breeds, as the *game breed*, the *Engliſh* or *white breed*, *the Poland* or *black breed*, the *Darking breed*, the *Shackbag breed*, the *Malay breed*. The two firſt of theſe breeds are much ſmaller than the others. As this ſort of ſtock, when under a proper ſyſtem of management, affords advantage both in the eggs and the chickens, it may be neceſſary to obſerve that the game and Poland breeds are in general the beſt layers, but that in reſpect to the ſize of the eggs the larger breeds are preferable. As ſetting- and breeding-fowls, the Darking and other large breeds are probably the beſt; but in what regards the colour, quality, and flavour of the fleſh, the game and the white breeds are ſuppoſed by thoſe who indulge in this ſort of food to be the moſt delicate.

In the management of poultry much depends upon proper conveniencies being provided for them. The method of conſtructing houſes for this uſe has been

already deſcribed. In order that there may be the leaſt poſſible interruption to the poultry, it is neceſſary that ſeparate places be provided for the purpoſes of their rooſting, ſitting, and being fattened in, as well as for containing their food; and, where the quantity kept is very conſiderable, for plucking and preſerving their feathers in; as by this means the ſyſtem may be conducted to the greateſt advantage. And where an attendant is kept for the purpoſe of feeding and taking care of this ſort of ſtock, it may be of conſequence to have the place which is deſigned for lodging in ſo ſituated, as that the ſmoke which it affords may paſs through the rooſting- and ſitting-rooms, as it has been long known that the ſmoke, as well as warmth thus communicated, is particularly grateful to the poultry, and highly promotes their breeding and thriving. This is ſufficiently ſhown by the vaſt quantities that are raiſed in the warm ſmoky cottages in Scotland and Ireland.

In addition there ſhould alſo be the conveniences of a yard, in which they may pickup ſandy or gravelly particles, with a ſmall graſs paddock for ranging in, in which there muſt be a ſupply of pure water. The whole of the internal parts ſhould be kept perfectly clean and free from vermin, by being frequently waſhed out and lime-whited.

In ſetting both the hen and the turkey, in order to prevent their inconveniencing each other, ſeparate neſts ſhould be provided in ſituations where they can be confined and kept from the reſt; as without this precaution the ſame neſt will have two or three upon it; by which much injury may be ſuſtained.

Hens may be kept in the proportion of about ſix or ſeven to a cock. Young ones are the beſt where eggs are the principal object; but where chickens are chiefly in demand the older kinds ſhould be preferred, as they ſit with more aſſiduity and cloſeneſs. Young hens moſtly begin to lay in January, or early in the following month; but this may be greatly promoted by the uſe of food of the more ſtimulant kind given with the grain, as buck-wheat, barley, hemp-ſeed, fenugreek, &c. in which intention any kind of refuſe animal matter chopped very ſmall has been found highly beneficial, alſo any of the ſmall ſorts of fiſh, ſuch as ſprats, &c. prepared in the ſame manner. But whatever ſort of food may be employed for the laying hens, it is eſſential to their producing a great number of eggs that they be not too much fed, though they ſhould not be keep too poorly, as from each extreme diſadvantage may proceed.

The periods of ſetting hens muſt neceſſarily vary according as chickens are wanted, but in general the latter end of February or the beginning of the following

month is a good ſeaſon for the purpoſe; as the weather will be getting warm about the time they are hatched. The period of ſitting is uſually about twenty-one days.

In ſetting the hens, the eggs ſhould always be ſuch as are new-laid and perfectly freſh, and the number ſhould not exceed a dozen. While ſitting, the hens ſhould conſtantly have a ſufficiency of food near them, in order that they need not be taken from their neſts too great a length of time. In the time of hatching, ſome adviſe the removing the firſt brought out chickens; but it is probably a better practice to let them remain, to be ſupported by the natural warmth of the hen until the whole brood is out. At this time ſome recommend their being put under a coop with the hen; but where the poultry-yards are well incloſed they may be ſuffered to follow the mother. Where there are more broods than one, the coops ſhould not be placed too near each other, leſt the hens ſhould deſtroy each others' chickens. It is beſt to feed the chickens firſt with ſteeped rice or ſplit grits with boiled potatoes bruiſed; but afterwards the refuſe wheat or barley may be given them with propriety, after having been boiled or ſteeped ſome time in water.

The proportions in which theſe ſorts of food are conſumed by young chickens vary according to their ſize; but in general it may be reckoned from one to two ounces per day, while they are in the early part of their growth, as from half a pound to two and a half pounds weight or more. In about ten or twelve weeks chickens moſtly become pretty fully grown. It is neceſſary to prevent young chickens as much as poſſible from picking up ſlugs, ſnails, and other ſimilar animals from the ground, and alſo to keep them as free as poſſible from the wet, as by theſe means they are extremely liable to become diſeaſed.

Various directions have been given for the fattening of poultry; but the beſt practice is probably that of confining them for a few days in dry well-ventilated places, which are covered ſo as in ſome meaſure to prevent the entrance of too much light, the fowls being previouſly kept in good condition in the poultry-yards. In theſe ſituations they ſhould be regularly fed three or four times in the courſe of the day with well-ſteamed potatoes, which are probably the cheapeſt ſort of food; as near Liverpool, in Mr. Wakefield's practice, which is upon an extenſive ſcale, it has been attended with the moſt complete ſucceſs, the poultry thriving perfectly well. Buck-wheat is likewiſe an uſeful and cheap food for this purpoſe, either given whole or ground into flour. Barley-meal, ground malt, and alſo coarſe wheat-flour, when mixed up with milk, or, what is better, water, as milk runs quickly into a ſtate of acidity, have been much recommended in this intention. From ſome

experiments, we are likewiſe inclined to believe that pea meal employed in the ſame way poſſeſſes a ſtill more fattening property, and is at the ſame time more economical, as going much further. A confinement of ſeven or eight days in this way will in general be ſufficient for effecting the buſineſs of fattening. When kept up long, fowls are extremely apt to be affected with diſeaſe. Whatever ſort of food is made uſe of, free air and a perfect ſtate of cleanneſs is eſſential in all the utenſils employed for the purpoſe, in order to prevent the food becoming acid, and the fowls affected with diſeaſe.

It is ſtated by Mr. Jackſon, in the ſixth volume of the "Commercial Agricultural and Manufacturer's Magazine," that he has found that "three pounds of meal, flour, or grain of ſuch a ſort as does not coſt more than one penny a pound, or to the farmer and cottager not even ſo much, with water, and what other fare the little creature can find for itſelf, will feed and fatten a chicken ſufficiently from the time of its burſting the ſhell till that of its being of a growth and in a condition ſuitable for its being carried to market." And that the allowance of another penny is ſufficient "for the attention and labour which its rearing requires. The prime coſt of the egg may be one halfpenny." Thus he conceives that even in the vicinity of any great town "a chicken that ſhall bring ninepence, or rather one ſhilling in the market, and is, in compariſon with other things, worth as much for the uſe of your own table whether you be a rich or poor man, may be produced and reared at the expenſe of fourpence-halfpenny." And it is further contended, that in proportion as fowls are kept for the conſumption of the portion of farinaceous food that is in daily waſte about farm-houſes, the expenſe cannot be more than one penny; conſequently by attention to this economical mode we may have abundance of poultry at a reaſonable rate. It is alſo ſtated that old fowls, "even though fed with food for which money proportionate to the juſt market value muſt be paid, will, by their eggs, pay annually at leaſt three times the coſt of their ſubſiſtence;" beſides the advantage of the manure which they produce.

An intereſting ſyſtem of management for poultry is ſtated by Mr. Young in his Calendar of Huſbandry, aspractiſed by Mrs. Boys of Kent. It is ſimply this: "The labourers' wives and families who live on Mr. Boys's farm do the whole; he ſupplies them with what offal corn is neceſſary, and they return Mrs. Boys the grown fowls ready for market at threepence each; ſixpence for turkeys and geeſe, and threepence for ducks; and her account, well kept, ſtates a profit of twenty pounds a year, after all expenſes are paid and the family well ſupplied." She has alſo "all the eggs without any payment." It is remarked that this ſyſtem of

practice is equally beneficial to the people who undertake it as the farmer. The climate and ſoil are there both highly favourable to the raiſing of poultry.

Fowls are liable to be affected with many different diſeaſes, but the moſt common ones are the following.

The *Pip*, which is diſtinguiſhed by a thin white ſcale being ſeated upon the tip of the tongue; and it is ſuppoſed to be produced by the fowls' notbeing kept ſufficiently clean, or the food and water being taken in a foul condition.

The beſt remedy is the removal of the ſcale, and the waſhing of the part with a weak ſolution of common ſalt in pure water.

The *Roup* is ſhown by the rump becoming ſwelled and enlarged, the feathers ſtanding awkwardly out, and the quills being full of blood. The cure is beſt effected by removing the feathers, and then in ſlight caſes uſing a weak ſaturnine waſh; but where there is much ſwelling the part ſhould be opened and the contents diſcharged.

The *Flux* is ſhown by the fowls' becoming ſuddenly thin and lean, and their not eating as uſual. It is moſtly cauſed by the uſe of too large a portion of moiſt fermenting food; or ſuch as has run into the ſtate of acidity. It is beſt removed by the giving of rice dry and wheat unground; the coop or other place in which they are confined being kept perfectly clean and well aired.

Stoppages are often produced in fowls by their picking up different ſorts of indiſſoluble ſubſtances; ſuch as old mortar, &c.: when in the crop they may be taken out by making a ſmall opening externally.

Blindneſs in fowls is beſt removed by changing their food, and letting them have more freſh air.

Galena or *Guinea Fowl.* This is a kind of fowl that lays a great number of eggs; but probably retains too much of its wild nature to be kept with advantage by the farmer. The leaſt diſturbance makes it forſake its neſt, which is moſtly made in ſome diſtant unfrequented ſituation. The fleſh of this ſort of fowl is ſomewhat dry, but has more of the game flavour than that of the common fowl.

Turkey.—In grain diſtricts, this is a bird that may perhaps be raiſed with advantage by the farmer; it is however very delicate and tender, requiring much attention and management while young. There are two breeds or varieties of this bird, the *black breed*, and the *white* or *ſpeckled breed:* the former is in general the largeſt and moſt hardy.

Theſe birds differ from others in not requiring the males to be conſtantly with the females during the laying ſeaſon, as in Norfolk it is a practice to ſend the hen

turkeys to ſome neighbouring cock to be impregnated, one act being found ſufficient for a brood. By this means there is a conſiderable ſaving, in not having cocks to keep the whole year round; and of courſe moſt little farmers raiſe this ſort of poultry, which is ſuppoſed a principal cauſe of their being ſo plentiful in that diſtrict*.

The turkey moſtly lays from eight to ten or twelve eggs, and hatches in about twenty-eight or thirty days. The young brood are extremely tender, and require conſtant care and attention for a month or ſix weeks after they are hatched to rear them with ſafety. They ſhould during this time be kept in a warm airy incloſed ſituation, perfectly free from wet, and be attentively fed with white bread ſteeped in milk that is quite free from acidity; or, what ſome prefer, alum curd mixed with chopped onions, for which uſe a proper ſupply of early young onions ſhould be provided, or old ones planted in this intention. After they have been managed in this way for about a month, they may be brought gradually to be ſupported on oat-meal and ſweet milk, or grain, of which buck-wheat is found the moſt ſuitable. As the expenſe in grain and trouble in the rearing of theſe birds is very conſiderable, from their being very greedy feeders, without great ſucceſs in raiſing them, and a certainty of high prices at the market, they can ſeldom repay the farmer.

Young turkeys may be fattened with great expedition by means of boiled potatoes and good barley-meal mixed well together, if they be kept fed in a regular manner. The practice of cramming them is a piece of ſtupid and unneceſſary cruelty, as it is evident they can only fatten in proportion to the quantity of food that is digeſted, whatever quantity may be forced upon them: beſides, they will conſume it faſt enough without forcing, if kept regularly fed.

Mr. Kent aſcribes the fineneſs of the flavour in the Norfolk turkeys, to the great dryneſs of the ſoil in that diſtrict, and the extenſiveneſs of the range which they are ſuffered to poſſeſs.

The difference between the living and dead weight of a turkey is thus ſtated by Mr. Young:—Live weight 21lb.; dead weight 14lb.

Water-Fowl.—Various birds of this deſcription may be kept with benefit by the farmer, where he is ſo ſituated in reſpect to water, commons, and other conveniences, that they can be managed without much attention or trouble; but in other caſes they are not worth his notice, as they will ſeldom repay the trouble of looking after them.

Ducks.—There are different breeds of ducks, but the common *white* or *Engliſh breed* and the dark brown or ſpeckled *wild breed* are in moſt eſtimation. The fleſh

* Marſhall's Rural Economy.

of the latter is higher flavoured than the former. Theſe birds may be kept with moſt profit to the farmer in ſituations where there are large ponds or ſheets of water for them to reſt upon near to the farm-yards, as in ſuch caſes they will require little or no trouble; but in other circumſtances, except where they are reared by perſons who make a buſineſs of dealing in theſe and other ſorts of poultry, they will afford little advantage in the way of profit, unleſs it be a few juſt for the purpoſe of the table. Ducks moſtly begin to lay early in the year, as the latter end of January or beginning of the following month, eſpecially when well fed. They require attention at this period, as they lay a great number of eggs, and are very apt to drop them in the water, or at random in other places. One drake is ſufficient for four or five ducks. When ſet, from ten to a dozen or thirteen eggs are a ſufficient number. They ſit about thirty days, and during the time ſhould be fed and have water near their neſts, to prevent the eggs from being injured by their leaving them too long. When hatched, they ſhould remain with the duck in ſome incloſed ſafe warm ſunny place, and be well fed with crumbs of bread, grits, or barley-meal and boiled potatoes well mixed and uſed freſh and freſh, ſand and clean water being conſtantly kept in ſhallow pans. The duck breeders have alſo in general a proviſion of worms, ſnails, and other ſimilar animals in readineſs for them when a little more advanced in their growth, as well as corn either in its ground or natural ſtate. It is likewiſe a point of great importance to keep them perfectly clean, and to let them have plenty of dry clean ſtraw as litter. The practice of raiſing ducks under hens ſeldom anſwers well, as their habits are by no means ſuited to the rearing of ſuch birds; nor has the cuſtom of trimming off the tails of the young ducklings any better foundation in reaſon. They ſhould never be admitted at full liberty till they are become quite ſtrong, as at a month or ſix weeks old. It is uſeful to keep them as diſtinct as poſſible from the others.

Ducks are greedy feeders, but not nice in the kinds of food. In the fattening of them, grain either in its whole or reduced mixed ſtate is probably the beſt ſort of food. The uſe of boiled potatoes well mixed with oatmeal is found to be an economical and expeditious method. Much, however, depends on their being fed in an exact and regular manner, and on a proper ſupply of water and ſand being conſtantly given; while at the ſame time they are kept in a perfectly quiet detached ſituation, not too much expoſed to the action of light, but well aired. When fattened on animal ſubſtances, which are very expeditious in accompliſhing the buſineſs, they are ſaid to have more reſemblance, both in the colour and flavour of their fleſh, to the wild duck, than in the common method. In the acorn-ſeaſon they are alſo

capable of being readily fattened on that ſort of food, and are allowed to be well-flavoured in their fleſh from it.

The eſtabliſhing of *decoys* for taking of *wild-ducks* is an object of ſome importance in particular ſituations, as where there are extenſive ſheets of water in ſequeſtered diſtricts at no great diſtance from the ſea, as in the wilds of Lincolnſhire, Norfolk, and other counties. Much nicety and exactneſs are however requiſite in the conſtruction and management of theſe, in order to render them effectual, as may be ſeen in Mr. Marſhall's excellent deſcription of the means of forming them, in the firſt volume of the Rural Economy of Norfolk.

The author of the Middleſex Corrected Report obſerves, that "it is clearly aſcertained, that ducks might be kept in ſuch numbers on corn-farms, as to prevent any ſenſible loſs or deſtruction in their crops by worms, ſlugs, and caterpillars; and yet we are always hearing of great loſſes occaſioned by thoſe vermin. The ſupport of a hundred or two of ducks on a farm is a trifling expenſe, and might be conſidered in the light of enſuring the young crops againſt being cut off. It is thought that many a farmer receives more damage to a crop in one ſeaſon, than would ſupport a ſufficient number of ducks to give perfect ſecurity for twenty years."

Geeſe.—There are ſeveral diſtinct breeds of geeſe kept in different places; but the largeſt and moſt uſeful ſort, whether for the purpoſe of food or feathers, is the *common breed.*

In the choice of ſtore-geeſe, great care ſhould always be taken to procure them as large in ſize as poſſible, and from places where they have been well kept. Geeſe, like moſt other birds, begin to lay in the ſpring months; and the earlier this happens the better, as the price of early green geeſe is generally high, and in ſome caſes it may be poſſible to have a ſecond brood. Both theſe purpoſes may be promoted by letting them be well fed with oats, grains, or ſome ſuch kinds of food at the period. The gooſe generally lays from eight to twelve eggs. It may be known when geeſe are about to lay, from ſtraw being frequently picked up and carried about by them. The length of time of ſitting is about thirty days. When geeſe are inclined to ſit, they generally ſhow it by remaining on their neſt after laying a conſiderable time. In this caſe, a proper quantity of eggs, as from ten to twelve, ſhould be placed in the neſts, and ſomething put before them, ſo as to prevent the geeſe from being much ſeen. They ſhould alſo have plenty of food, ſand and water near them, in order that they may not have to remain long off the neſts, and in that way let the eggs be too much cooled. The ganders ſhould be left with them as guards. When the weather is warm they generally hatch rather ſooner than when it is cold. After the goſlings are hatched,

the beſt method is to let them remain with the gooſe, eſpecially where they are ſtrong, in ſome warm ſunny place, that is well ſecured againſt the entrance of rats, and all other ſorts of vermin, and which is properly ſupplied with water; being well fed with the crumbs of bread, grits, wheat, and ſome chopped clivers. They ſhould remain in this confinement until they are grown ſtrong and capable of following the gooſe with eaſe; they may then be put into a ſmall field, or paddock, where the graſs is ſhort, till they are fit to be turned out with the geeſe. When they are weakly it is cuſtomary to feed them in the houſe, with bread ſoaked in milk, or a little barley-meal, &c. Where this is done, they ſhould however always be put under the gooſe again immediately after ſuch feeding, and handled as little as poſſible, warmth in this ſtage being the moſt eſſential article in rearing them. They ſhould never be ſuffered while very young to go into the water, as the cold ſoon deſtroys them.

Where the raiſing of theſe birds is an object, care muſt always be taken to have good ganders, which are neither too young nor too old, and that the eggs when laid be turned occaſionally, and carefully kept in a dry and rather warm place. The number of geeſe to a gander ſhould not be too great: three or four are quite ſufficient.

The practice in Lincolnſhire, where vaſt numbers of theſe birds are annually produced, is for their neſts to be made for them of ſtraw, and confined ſo as that the eggs cannot roll out when the geeſe turn them, which they do every day. When near hatching, the ſhell is broken a little againſt the beak or nib of the goſling, to give air, or to enable it to receive ſtrength to throw off the ſhell at a proper time.

The time of plucking them is about the beginning of April; when the fine feathers of their breaſts and backs ſhould be gently and carefully plucked: care muſt be taken not to pull or interrupt their down or pen feathers.

The quills ſhould be pulled five out of a wing. They will bear pulling in thirteen or fourteen weeks again, or twice in a year: the feathers three times a year, of the old geeſe and ganders, ſeven weeks from each pulling. The young geeſe may be pulled once at thirteen or fourteen weeks old, but not quilled, being hatched in March. But when late in hatching, the brood geeſe ſhould not be plucked ſo ſoon as April, but the month after. When well fed with barley and oats, they thrive and do better, and their feathers grow faſter and are better in quality than where it is omitted. They muſt conſtantly have plenty of graſs and water *.

* Annals of Agriculture, Vol. XV.

In many parts of this fenny diſtrict vaſt advantage is made by the frequent plucking of the geeſe. At Pinchbeck it is the practice to pluck them five times in the year, as at Lady-day, Midſummer, Lammas, Michaelmas, and Martinmas. The feathers of a dead gooſe are worth 6d. three giving a pound. But plucking alive does not yield more than 3d. a head per annum. Some wing them only every quarter, taking ten feathers from each gooſe, which ſell at 5s. a thouſand. Plucked geeſe pay in feathers 1s. a head in Wildmore Fen*.

In the fattening of *green* geeſe, care ſhould be taken that a little green food be given them along with the oats or other grain that may be employed for the purpoſe when they are put up, and that they be well ſupplied with water and ſand. A fortnight or three weeks is long enough for this purpoſe, if they be well and regularly fed; but, in the fattening of the older geeſe, there will not be any neceſſity for the green food. The place in which they are confined with this view ſhould neither be too light, nor too public in its ſituation, as they do not feed ſo well where theſe points are not attended to. They ſhould likewiſe be at a diſtance, ſo as to be out of the hearing of the old or ſtore-geeſe.

Beſides the benefits that may be derived from geeſe in the feathers and the birds as food, it ſeems not improbable but that they might be made to produce a conſiderable advantage in the way of manure, if managed under a ſyſtem of conſtant littering with ſtraw, fern, or ſome other ſubſtance of the ſame kind, as from the great quantity of graſs they conſume the diſcharge in the night is very conſiderable.

Pigeons.—Though pigeon-houſes are common on many farms, it is in very few inſtances, probably, that this kind of ſtock, when the various diſadvantages of it are conſidered, can be converted to much profit by the farmer. It is well remarked by an intelligent cultivator, that "the increaſe of pigeons beyond a certain degree muſt doubtleſs be injurious to the cultivation of grain: within due bounds, they do little harm; but increaſed beyond it, they prove pernicious vermin both to the new-ſown crops and the early part of harveſt. They are particularly voracious in early peas; therefore the advantage ariſing from their increaſe for conſumption as food, is more than counterbalanced by the miſchief occaſioned by their depredations†." And in Norfolk, pigeons are much fewer than formerly, as many of the pigeon-houſes have been dropped, on account of the injury which the pigeons do to thatched buidings‡. The ſame is the caſe in Kent and other counties.

* Young's Agricultural Report of Lincolnſhire.

† Pitt's Corrected Report of Staffordſhire. ‡ Ibid. of Norfolk.

They are particularly injurious to the grain crops juſt at the time of harveſt, by ſettling in large flights upon the ſtanding corn, and in this way doing more miſchief by beating it down than by the quantity they conſume.

Where this ſort of ſtock is kept, warm ſheltered ſituations, open to the ſouth, are the moſt advantageous, as the pigeon delights in warmth, and being expoſed to the influence of the ſun.

It is alſo of importance in the economy of theſe birds, that the floor of the dove-cote be nearly upon a level with the holes where they enter, and that theſe holes be not too large or too numerous: the holes where they form their neſts ſhould not be much incloſed, as pigeons delight in being at liberty. Salt and ſtrong ſcents, ſuch as that of aſſafœtida, are ſaid to be agreeable to theſe birds, ſo as frequently to attach them to their habitations.

The pigeon ſeldom lays more than two eggs at one laying, ſitting about twenty days, the male and female alternately. They are capable of breeding frequently, but in general produce only two or three broods or flights in the year. There are ſeveral ſorts, but the common blue pigeon is probably the moſt productive. The tumblers are ſmall, but very domeſtic.

After recommending the harveſt flight of pigeons as the moſt proper for the purpoſe of ſtock, as being the ſtrongeſt to withſtand the winter ſeaſon, the author of the "Experienced Farmer" gives the following directions on the management of theſe birds. In regard to feeding them, it is adviſed as only neceſſary during the ſeaſon between ſeed-time and harveſt, when "it ſhould be done by three or four o'clock in the morning; as they riſe early. If you ſerve them much later, they will keep hovering about home, and be prevented taking their neceſſary exerciſe." If fed "the year round, they will not breed near ſo well as if forced to ſeek their own food; for they pick up in the fields what is pleaſant and healthy to them, and from the beginning of the harveſt to the end of ſeed-time they find plenty." They may be fed with tares, grain, or ſeeds of any kind.

"Be cautious of not letting the firſt flight fly to increaſe the flock, but let every one of them be taken; as theſe will come in what is called benting-time, that is, between ſeed-time and harveſt. It is then that pigeons are the ſcarceſt; and many of the young ones would pine to death through weakneſs during that ſeaſon.

"At the latter end of every flight care ſhould be taken to deſtroy all thoſe eggs which were not layed in a proper time. The proper time for the ſpring-flight is in April and May. After the harveſt-flight, cold weather begins to come on, which injures the old pigeon much if ſhe ſits late; and the young will be good for nothing if hatched."

"It is very neceſſary to pay attention to cleanlineſs in the management of a dove-cote. Before breeding-time the holes ought to be carefully examined and cleaned; for if any of the young die in the holes in ſummer, maggots are ſoon bred in them: they become putrid, and emit a diſagreeable and unwholeſome ſtench, very injurious to the inhabitants of the dovecote. Pigeons are tenacious of their neſts, as appears from the conduct of the wood-pigeon, which will breed for years in the ſame tree, and the mother forſakes her neſt with regret; but, unable to endure the filth and ſtench of her dead offſpring, ſhe is obliged to quit the eggs ſhe has laid for a ſecond brood, and the prime of the ſeaſon is loſt. Every ſummer, immediately after the firſt flight, the neſts ſhould be all cleaned out, and the dung totally taken away, as it breeds filth. But remember to do this buſineſs early in the morning." The remaining eggs ought likewiſe to be deſtroyed, and a perfectly clean habitation made for the harveſt-flight.

It is adviſed "never to go into a dovecote later than mid-day, but as early in a morning as convenient. Whatever repairs are neceſſary, either to the building or to the neſts, ſhould be done before noon: for if you diſturb the pigeons in the afternoon, they will not reſt contentedly the whole night; and the greateſt part, perhaps, will not enter the cote until the next day, but will ſit moping on the ground; and, if in breeding-time, either a number of eggs may be ſpoiled, or ſeveral young ones ſtarved to death."

Pigeons are ſuppoſed to be more productive from the breeds being croſſed, in proof of which a few tame pigeons were put into a dovecote; and the conſequence was, that a more early and a more numerous hatch of young were produced than in any of the neighbouring cotes*.

Theſe birds have a great antipathy to owls, which find their way ſometimes into dovecotes; and there is no getting rid of ſuch troubleſome gueſts but by deſtroying them. "Rats are terrible enemies to pigeons, and will ſoon deſtroy a whole dove-cote. Cats, weaſels, and ſquirrels will do the ſame. It will be neceſſary, therefore, to examine the dovecote once every week at leaſt, very minutely," to ſee that there are none of theſe intruders.

Pigeons "make an extraordinary good manure, which, if worked up into a compoſt, inſtead of being uſed in the preſent ſlovenly way, would be of ſtill more value."

Bees.—How far theſe induſtrious inſects may be kept as a part of the farming-ſtock with profit has not yet been fully ſhown; but as they require little trouble, and there is in moſt country ſituations a ſufficiency of food ready provided for their

* Experienced Farmer.

ſupport, there can be little riſk in the farmer making the trial, eſpecially as the capital required will be but trifling.

In undertaking this ſort of ſtock, the beſt ſituation is in general where the hives will be leaſt expoſed to wind, and enjoy as much of the influence of the ſun as poſſible; for wind always retards bees in their work, while the ſun's influence invites them to it. Though it is well known bees thrive well in high and windy ſituations, a low one is always to be preferred. Mr. Bonner adviſes "an early ſituation; a hollow glen by the ſide of a rivulet, ſurrounded with abundance of turnips in bloſſom in the ſpring, muſtard and clover in the ſummer, and heath in the latter end of ſummer and harveſt with a variety of other garden and wild flowers in their ſeaſons." It is an obſervation as old as Columella, that the bee-garden ſhould conſtantly face the ſouth, and be placed in a warm valley near a ſtream.

It has been well remarked, that "a plentiful aſſortment of bee-flowers is a conſideration that requires attention, if we deſign to favour an ample production of honey. The nearer the paſturage is to the apiary, the more journeys the bees can make in a day, and conſequently the ſooner they will be able to fill their hives. The product from a large ſupply, but at a ſmall diſtance, and in a temperate ſituation, even with the common management, will be ſuperior to that of the moſt ſkilful in a bad one. On the contrary, with bad management, and with ſcanty paſturage and indifferent ſituation, a very trifling profit can be expected. Britain in general is but thinly ſtocked with bees. Few farmers in compariſon eſteem them worth their notice; it is from the attention of cottagers we derive the chief ſupply of honey and wax. It will be readily admitted, that a large number of ſtocks kept within a ſmall circuit, and in a bad ſituation, will be prejudicial to that circuit, as being more than can be ſupported in plenty, and will neceſſarily impoveriſh each other. The ſtate of any particular ſituation may be known by the general product for ſeveral years together, and not from one or two years only; but more certainly from what a very good ſeaſon will produce, which may be accounted as a ſtandard. But there are many ſituations capable of feeding a much larger number of ſtocks than are to be found on them. However, if the generality of farmers and cottagers individually would keep a few ſtocks, nearly all the honey and wax this country could produce might be collected. This would not only benefit individuals, but might alſo be of real national utility*."

It is added, that "large heaths and commons, ſurrounded with woods, are noted for being abundantly productive; the firſt abounding with wild thyme, and various

* Keys on the Management of Bees.

other flowers untouched by the ſcythe, and the other with a profuſion of farina and honey-dews. Heath and broom are very ſerviceable, as continuing long and late in bloom." It is remarked "that the domeſtic bees are very nice in their ſelections, and do not rove from one ſort of flowers to thoſe of another indiſcriminately. They are limited to a few kinds; thoſe of the moſt gaudy colours, and which afford the moſt reſplendent ſhow and agreeable odours, are moſtly neglected by them, as hyacinths, jeſſamines, roſes, honey-ſuckles, &c. while very ſmall flowers, or thoſe of little note, are to them plentiful ſources of nectareous ſweets. Sallows furniſh a larger quantity of farina than moſt other plants, and that as early as the bees have occaſion for it. Roſemary is the firſt aromatic plant that blows; it grows wild in ſome parts of France, and is the cauſe of that ſuperiority for which the Narbonne honey is eſteemed. Minionette yields good honey, and is valuable for its long continuance in bloom, even till November. Beds of it near an apiary will be of advantage, as will edgings of creeping lemon-thyme along the borders of the garden. Single wall-flowers in plenty will be ſerviceable. Lime-trees are not to be neglected about apiaries, ſerving in a double capacity by their flowers and their leaves, which are frequently covered with honey-dews. Neither beans nor orchard-trees afford any great quantity of honey; as may be obſerved by the ſtocks in Hereſordſhire, which, though abounding in orchards, is not more productive in honey than other counties. In contraſt to this, the borders of Cambridgeſhire and Hertfordſhire, and part of Hampſhire, abounding with large heaths, commons and woods, are much more productive than any other parts of the kingdom. Farmers there have been known to keep from a hundred to a hundred and fifty ſtocks of bees*. But vipers' bugloſs, and borage, are the two plants to be moſt depended upon for providing rich hives†.

In reſpect to ſtands, the beſt arrangement is probably that of ſeparate ones for each hive, made by driving four ſtrong ſtakes into the ground, at equal diſtances, as thus, : : corresponding to the dimenſions of the hive floors to reſt on: they ſhould be ſixteen inches above the earth, and the tops upon a level with each other; the diſtance three or four feet from each other, and not too many together.

In purchaſing ſtock-bees the "beſt time is juſt before the taking-up ſeaſon, which is generally about the latter end of Auguſt; for then bee-keepers reſerve as many of the beſt ſtocks as they judge expedient for their next ſummer's ſupply, and therefore, after that period, are not diſpoſed to part with any, unleſs at an advanced price; whereas, by purchaſing ſome time before, a choice may be made of the beſt,

* Keys on the Management of Bees. † Ibid.

and at the accuſtomed rate. They ſhould be ſelected by a ſkilful perſon, in a cool evening, or rather morning very early. By tapping about the hive, a pretty near gueſs may be formed whether or not it is full of bees, as alſo if full of combs. But for greater certainty, turn thoſe that ſeem heavy upon the edge of the hive, and obſerve if the interſtices between the combs are crowded with bees, and the combs worked down to the floor. If white, or of a light yellow, it denotes their being of the preſent year's produce, and fit for the purpoſe; but if they are of a very deep yellow or brown, they are of the laſt ſeaſon, and not ſo proper; while thoſe that are dingy or blackiſh are old, and wholly unfit to furniſh a proſperous apiary. But though a hive may have the edges of the combs of a light yellow, they may be old ſtocks, whoſe combs the preceding year not having been completed, have in the preſent had new borders added to them of virgin wax, ſo as to look like young ſtocks. Look carefully between the combs, as far as the bees will admit; and if the interior parts appear favourable, form a judgment accordingly. The hive ſhould be poiſed in the hand; and if it be about half buſhel ſize, and weigh twenty-five pounds or upwards, it is another teſt of its being a good ſtock*."

The "removing of ſtocks ſhould take place in the evening, or very early in the morning. The hive ſhould be raiſed by three or four wedges, ſome hours before, provided the floor is not moveable; or otherwiſe many bees will remain on the floor at the time, and be very troubleſome. A cloth muſt be laid on the ground behind the hive to be removed; nimbly lift the hive thereon, and gathering the four corners tight, tie them faſt on the top: immediately draw a ſtring cloſe round the body of the hive, to prevent any bees crawling between†." They muſt be conveyed in a gentle manner.

In regard to hives, ſtraw is the beſt material, "as protecting the bees the moſt perfectly in the extremes of cold and heat, and being alſo generally eaſieſt to be procured. Where it is not ſo, ruſhes, wicker-work plaſtered over, or ſedges, may be ſubſtituted in its ſtead. For this uſe, unthraſhed ſtraw ſhould always be employed, of all kinds of which that of rye is to be preferred, as thraſhing ſhivers and makes it rough and ſhaggy, which the bees with much labour are obliged to gnaw off‡. They are made of different forms or ſhapes, but thoſe in common uſe anſwer very well; they ſhould be neatly hooded over with an upper coating of ſtraw§.

The chief attention neceſſary in the management of bees is at the period of their ſwarming, when great care ſhould be taken to ſecure them.

* Keys on Bees. † Ibid. ‡ Ibid. § Pitt's Agricultural Report of Staffordſhire.

In eſtimating the profit of this ſort of ſtock, it has been ſuggeſted that "one conſideration ſhould not be overlooked, viz. that almoſt the whole produce, ariſing from the ſale of both honey and wax, is in a great meaſure clear profit; as bees and bee-hives are equally free from rents and taxes; and the culture of them does not in the leaſt injure or impede any other improvement in any reſpect. Nor do they require a conſtant attendance, as moſt other articles of improvement do; for a proper perſon might eaſily overſee, with a little aſſiſtance in ſwarming-time, at leaſt five hundred bee-hives. And as Nature has amply ſupplied them with food, and with powers to provide it for themſelves, they put their owners to little or no expenſe for that article; which cannot be ſaid of any other of our ſervants whatever*."

It is a circumſtance that deſerves notice, that, by attention in the bee-maſter in the ſelection of food, almoſt any flavour or colour may be given to the honey, from the bright amber to a pale yellow. Mr. Paterſon, of Caſtle-Huntley, in Scotland, found the flavour very delicate from minionette; it is the ſame from roſemary. Bean-honey is pale, and heath-honey brown, with much difference in flavour †. In Norfolk they commonly ſuppoſe the honey debaſed by the great quantity of buck-wheat that is grown; but Mr. Marſhall ſuſpects it to depend either wholly or in a great part on the heath.

Fiſh-ponds.—In particular ſituations, eſpecially where the proprietor of the land keeps it under his own management, it may not only be convenient and agreeable, but likewiſe highly profitable, to have ponds for the breeding, rearing, and preſerving of different ſorts of fiſh. Where ponds for this uſe do not naturally prevail, they may in many caſes be readily formed, particularly where there are very gentle falls or valleys between hills, or other depreſſions taking place in the grounds; and through which waters paſs with a flow or very eaſy current. The nature of the ſituation will ſhow the extent of the ponds, and the number that can be readily formed. Where water and ſituation admit, two, three, or more may be made on the ſame line or courſe, the head of one conſtituting the bottom of the other. And from one to four or five acres of ground may be covered with water, according to the ſupplies and other circumſtances.

In ſuch ſituations the only expenſe of forming convenient fiſh-ponds is that of conſtructing heads or banks acroſs the valleys, or depreſſions, for the purpoſe of damming up the waters to the requiſite heights, with proper ſluices; which in moſt caſes, eſpecially where clay is at hand, may be done with but little expenditure of

* Bonner on Bees. † Perth Agricultural Report.

money. Theſe banks or heads ſhould be formed on foundations of ſufficient depths, as from two to three or more feet, and in breadth proportioned to the extent and preſſure of the water. The wall in the middle part, which ſhould not be leſs than three or four feet in width, being wholly made by *puddling* pure clay, which in many inſtances may be chiefly procured by ſloping out the ground intended for the ponds, or digging out ſmall ponds for *ſtews*, &c. If clay can be eaſily got from other places, it is, however, better to let the ground for the ponds remain, as the fiſh feed better for it. As the work of puddling advances, earth muſt be well rammed to the different ſides of the wall, and, when finiſhed, the whole immediately well covered over with it, in order to guard againſt cracking. In caſes where the ground on the ſides riſes in a very gentle manner, banks or heads of from ſix to eight or nine feet in height will often be capable of covering ſome acres of land with water. But in the contrary circumſtances they will be required to be conſiderably higher, as well as of greater breadth and ſtrength. This may be eaſily regulated by proper levelling:—ſuppoſing ten feet to be a ſufficient height in the centre for raiſing the water, the foot of the bank ſhould not be leſs than thirty-five, being gradually narrowed or ſloped on the ſides ſo as to bring it to eight or ten on the top. It is better, however, to have the ſide next to the water more ſloped than the other. Some ſuch proportion as this ſhould be preſerved in all caſes, always giving them too much rather than too little breadth in their foundations. Proper grates, ſluices, and diverting channels for taking off the water in the time of floods will likewiſe be neceſſary; the laſt being formed and conducted along the ſides of the ponds, where there are more than one, and the ſluices fixed in the loweſt parts. Theſe ſhould be made perfectly ſtrong of good ſeaſoned oak, and be well fixed in the banks, and the clay tightly rammed in about them*.

The expenſe of conſtructing heads and banks of this nature, including every thing, may in moſt ſituations be eſtimated at from one to two ſhillings the cubical yard.

In raiſing carp it is often the practice to have three ponds: one for the purpoſe of ſpawning the fiſh in, and in which they ſhould be left during the reſt of the ſummer and the following winter, as they moſtly ſpawn from the beginning of May to the latter end of July; another for the convenience of nurſing up the young fry, into which they ſhould be put about the latter end of March or the beginning of April, chooſing a calm but not ſunny day for the buſineſs. After which they ſhould be carefully

* North in Annals of Agriculture, Vol. XXXVIII.

prevented from coming to the ſides and being deſtroyed. In this pond they may remain two years and become four, five, or ſix inches in length, and good foruſe; the third or main pond is deſtined for the reception of the grown fiſh, as thoſe that meaſure a foot or more including the heads and tails.

The proportions in which theſe different ponds are adviſed to be ſtocked are theſe:—for each acre of the firſt ſort, "three or four male carps, and ſix or eight female ones." The moſt ſuitable ſort for this uſe being "thoſe of five, ſix, or ſeven years old, in good health, with full ſcale, and fine full eyes, and a long body without any blemiſh or wound." The ponds ſhould be previouſly cleared of all ſorts of voracious fiſhes and other animals, as "perch, pike, eel, and trout; the water-beetle, and alſo the newts or lizards*." Such ponds as are warm and have an open expoſure, with ſoft water, are the moſt proper for this uſe, all kinds of water-fowl being kept from them. For the nurſing ponds a thouſand or twelve hundred may not be more than ſufficient for an acre; and for the main ponds, one to every ſquare of fifteen feet is the proportion adviſed, as their growth depends greatly on the room and quantity of food that is allowed†. The beſt ſeaſons for performing the buſineſs, in this caſe, are thoſe of the ſpring and autumn. Some adviſe in theſe caſes the ſtocking with carp or tench in the proportion of three to a ſquare perch‡.

In firſt ſtocking large ponds or waters, as where they are of the extent of three or four acres, carp in the proportion of three hundred to the acre are recommended; but where they do not extend to ſuch ſizes, not ſo great a proportion. And in re-ſtocking, after two or three years, four hundred to the acre§.

Where the ponds are ſuitable for tench, the firſt ſtocking with them in ſuch caſes may be rather more, and in the re-ſtockings conſiderably more, as ſeven or eight hundred to the acre.

As perch are great breeders, in firſt ſtocking with them ſix hundred to the acre may be ſufficient. In Berkſhire, where there are many ponds for the preſerving of fiſh, they uſually ſtock with carp or tench in the proportion of one hundred to the acre, the fiſh remaining four years in them‖. But in the management of Sir Harry Featherſtone, in Suſſex, in a pond of twenty acres reduced to ſixteen by the depoſition of mud, the ſtock is generally in the proportion of twelve hundred carp and an equal number of tench; or at the rate of ſeventy-five brace to the acre. And in this proportion they are ſaid to ſucceed well¶. Where pike does not form any

* North in Annals of Agriculture, Vol. XXXVIII. † Ibid.
‡ Annals of Agriculture, Vol. XXXIX. § Ibid. ‖ Ibid. Vol. XLI. ¶ Ibid. Vol. XXXIII.

part of the ſtock of ponds, care ſhould however always be taken not to overſtock, as where theſe ſorts of fiſh have not an abundant ſupply of food, they never anſwer well. When taken from cloſe-ſtocked ponds, a larger proportion ſhould likewiſe be employed than in other caſes.

The waters of ſome ponds are better adapted to raiſing ſome ſorts of fiſh than others. Thus, thoſe where the water is rich and white are more adapted for carp; while ſuch as have a thicker appearance, and where there is a greaterdepoſition of muddy matter, are better ſuited to tench. Perch are capable of being raiſed in almoſt any ſort of ponds. Eels ſucceed beſt where the ponds are not very large, but where fed by a ſpring, and there is a large portion of rich ſediment. Pike ſhould never be kept in ponds with carp or tench, but in ſeparate breeding-ponds, where the ſupplies of ſmall fry are conſiderable and not wanted for ſtores.

Carp, tench and perch are the ſorts principally cultivated with a view to profit, with a few eels occaſionally. But perch and eels ſhould not be admitted where the ponds are but thinly ſtocked, as they are great devourers of the young fiſh.

Carp and tench anſwer beſt together where the extents of the ponds are pretty large, as, in other caſes, the former, from being a much more powerful fiſh, beats and deprives the latter of his food. Carp ſeldom afford much profit in ponds of leſs extent than half an acre; but tench thrive well in thoſe of almoſt any ſize, being often found good in ponds of only a few perches ſquare. Carp, perch, and eels ſucceed well together; and alſo tench and eels*. Carp more frequently injure themſelves by breeding than tench; though it ſometimes happens with the latter. It is not improbable, but that in ſmall ponds it may be the beſt practice to keep the carp and tench ſeparate.

The produce or profit afforded by fiſh-ponds has not yet, perhaps, been ſufficiently attended to in different ſituations to afford correct concluſions; nor is it well aſcertained what is the annual increaſe in weight in fiſh of different kinds, in different periods of their growth, and under different circumſtances of ſoil and water. Mr. Loveden ſtates, that in Berkſhire a pond of three acres and a half, drawn after being ſtocked three years with ſtores of one year old, produced

Of carp, 195 lb. weight
Of tench, 230 ditto.

425 which ſold for 20l. 10s, or nearly 2l. 6s. per acre per annum.

* Annals of Agriculture.

And the ſame pond ſtocked with tench only, drawn three years afterwards, afforded about 26l.*

On the ſuppoſition that in a pond which ſupports 2400 fiſh, half a pound each be added annually, it will be a 1200lb. weight, which at 6d. per pound is 30l. and for fifteen acres 40s. per acre, and at 9d. per lb. 3l. per acre†.

Theſe are profits, though by no means great, that ſhould draw the attention of farmers to the cultivation of this ſort of ſtock wherever they have opportunities of making ponds with facility for the purpoſe, as the trouble of them is almoſt nothing.

And, beſides, it is probable that, by more care in the ſtocking and other parts of their management, ſuch ponds might be rendered much more productive. Where the ponds are ſupplied by ſtreams, feeding will ſeldom be neceſſary, but in other caſes it may ſometimes be uſeful. In theſe inſtances bread compoſed of coarſe flour and potatoes ſunk in cabbage nets may be made uſe of. Many other ſubſtances have likewiſe been recommended. In ſevere froſts the ice ſhould be daily broken to afford air, as without this precaution a great number of fiſh will frequently be deſtroyed in ſuch ſeaſons.

* It is remarked that in this diſtrict, the price is, when ſold by the pound, *one ſhilling* for tench and *tenpence* for the carp; which is the beſt mode of ſelling them. But when by number, they are meaſured from eye to tail, and ſold as under:

		l.	*s.*	*d.*			*l.*	*s.*	*d.*
Tench *meaſuring under*	12 *inches*	3	0	0	Carp	12 *inches*	5	0	0
	12 *ditto*	5	10	0		14 *ditto*	6	10	0
	14 *ditto*	7	0	0		16 *ditto*	8	0	0

† Annals of Agriculture.

ADDITIONS AND CORRECTIONS

TO THE SECOND VOLUME.

To be read after Line 25, *Page* 585.—In Norfolk they never drill peaſe at a greater diſtance than nine inches. When they are dibbled they plant two rows on a flag, ſo that they cannot be above four inches from each other.

To be read after Line 16, *Page* 595.—It is the cuſtom in Norfolk to dibble beans in the ſame manner as the peaſe, &c. except that they never ſet more than one hole on a flag. The plants are perhaps eight inches aſunder, but are rarely buried above an inch. They turn ſheep in when the beans are two or three inches high, to crop any graſs which may have got up between the furrows. Sheep do not eat the beans, or in any degree injure them. With this mode of management they can grow from ten to fourteen coombs an acre. They always hand-hoe beans twice, and ſometimes thrice. Where the ground is very ſtiff and hard, they harrow once or twice in a place before they dibble.

To be read after firſt Line, Page 825.—Mr. Saliſbury, the preſent proprietor of the Brompton Botanic Garden, obſerves, that he ſent this ſeaſon, *early in May*, to the Board of Agriculture, a bundle of this graſs which was in full bloom, and at the great height of *thirty-two inches*; it was ſown in his ground, in September 1802, by way of experiment with other kinds: the land was far from rich, and had had no manure for ſeveral years previous to this being cut. It has been obſerved that the Alopecurus pratenſis *if ſown alone*, and cut for hay, dries in far leſs time than any other graſs, and requires to be ricked ſooner, for its quality will be injured by too long expoſure. If it be mixed with other graſſes, the whole will be fit for the ſtack the ſooner.

To be read after Line 3, *Page* 827.—It has been remarked by Mr. Saliſbury, that this graſs is likely to be a ſcarce kind in cultivation, as the ſeed is not to be collected in any quantity, neither does it produce it abundantly when grown on purpoſe.

To be read after Line 20, *Page* 827.—According to Mr. Saliſbury, this graſs in certain ſituations is to be ranked among the beſt and moſt productive graſſes; but on examining the plant in many other places where it grows ſpontaneouſly, he finds it ſo very ſmall and poor, that unleſs circumſtances were much in its favour, agriculturs ſhould, he thinks, be careful how they hazard the ſowing it; the places where it is obſerved to thrive beſt, are, he ſays, in low wet ſoils conſiſting of a heavy loam and clay: farmers who have lands of this deſcription would certainly do well to ſelect this kind for the purpoſe, as it is ſweet, and ſeems to poſſeſs all that is neceſſary for either paſturage or hay.

To be read after Line 3, *Page* 828.—The ſame able botaniſt obſerves, that no plant whatever deſerves more the attention of the farmer than this, it being of certain growth, eaſy culture, productive, and remarkably ſweet. It will thrive in either dry or wet ſoils,—an advantage which moſt others do not poſſeſs; it appears to be little inferior to fox-tail, except in point of the early growth.

One reaſon why this as well as many other graſſes were not formerly more generally introduced into cultivation, was the difficulty of diſtinguiſhing the graſſes from each other; but which, from the ſtudy of agricultural botany, is now in ſome meaſure done away: but a greater till lately has always preſented itſelf, which was the difficulty of procuring pure ſeeds of the different ſorts: this too has now been in a great degree remedied by the exertions of Mr. Saliſbury, who, with ſome country gentlemen, have laid down land ſufficient to ſupply the principal ſeedſmen and others with large quantities; and it may be expected that in a ſhort time the markets will be generally ſupplied with them as well as with rye-graſs, which was the only one to be purchaſed till within theſe few years.

To be read after Line 28, *Page* 828.—Mr. Saliſbury has not found the ſame fault in the culture of this graſs as is mentioned by Mr. Curtis, which is, that it is apt to become thin and almoſt diſappears after a while; on the contrary, he finds it ſtands the drieſt ſoil equal to any, gets matted together and forms a moſt delightful turf in very dry weather.

To be read after Line 32, *Page* 829.—This graſs, Mr. Saliſbury ſays, ſeems to chiefly affect a loamy ſoil, is not very productive, but, being a ſtrong perennial, has been much recommended: it flowers about the time of the above, and is conſidered good

for ſheep food; and the butter made from paſtures where it grows is generally eſteemed excellent.

To be read after Line 19, *Page* 835.—Mr. Saliſbury thinks this an extremely uſeful plant, which makes good paſturage and hay, but which thrives only in a loamy ſoil. It is frequently found wild in waſte lands where the ſoil is good; and, in fact, he conſiders it as a juſt criterion to judge of the fertility of a ſoil by.

To be read at the end of Section XI. *Page* 901.—The buſineſs of hiring and ſtocking farms deſerves more attention than is commonly beſtowed upon it. For the preſent purpoſe, it is however only neceſſary to place before the farmer the principal circumſtances which ought to regulate his conduct, as the ſubject has been very fully handled by an agricultor of much practical experience*.

The changes in regard to farming property are in general, in the more ſouthern parts of the kingdom, made about Michaelmas. In theſe the farmer ſhould deliberately conſider the nature of the ſoil, the climate, the relative ſituation in reſpect to the convenience of improvements and markets; the ſize in regard to his capital, the manner in which the incloſures are diſpoſed with reſpect to each other, the management of the former tenant, the covenants by which he is to be ſettered, and, finally, the amount and arrangements in regard to rent. Having made theſe conſiderations with proper minuteneſs and attention, weighing their advantages and diſadvantages in his mind, without ſuffering himſelf to be influenced by probable cauſes, he may be enabled to bring their benefits into competition with their diſadvantages, and to compare the former with the amount of rent which he is required to pay, in ſuch a manner as to decide on the propriety or impropriety of his engaging them. In this matter great care ſhould however be taken, that real inconveniences or difficulties be neither too much magnified nor too greatly deſpiſed, ſo as to produce a too haſty or too protracted deciſion; from both of which, evils may proceed. By the latter, the ſecuring of an advantageous farm may often be loſt, while the former may lead to the engaging of one that is not by any means adapted to his circumſtances. In theſe caſes the farmer ſhould never ſuffer himſelf to be too much influenced in his determinations by the circumſtances of the preceding occupiers, as ſo much depends upon

* Mr. A. Young.

management, that with one ſort there may be conſiderable loſs, while under another a very adequate profit may be derived.

The circumſtances in reſpect to the nature of the ſoil, which have been chiefly directed to be attended to by Mr. Young, in fixing upon a farm, are theſe: "ſtiffneſs, moiſture, expoſure, levelneſs, ſlope, ſtoneineſs; what draining, manuring, fencing, &c. will be wanted: the roads, diſtance of market, prices of commodities, labour, &c. the ſtate of tithes or gathering; the poor rates, the compactneſs of the fields, and covenants relative to cropping;" as "many ſuch are extremely detrimental to a good conduct of the land." And "one general rule in hiring a farm ſhould not, he ſays, be forgotten—to fix on good land, and he can ſcarcely pay too much for it; but, for poor ſoils, the leaſt rent is ſometimes too high to be conſiſtent with profit. By poor ſoils, however, are not to be underſtood ſuch as have a command of laſting manures, that work great improvements; nor waſte lands, which, under that falſe denomination, are often found the moſt profitable of all."

It is obſerved "that the ſound, mellow, rich, putrid, crumbling, ſandy loams are of all ſoils the moſt profitable; ſuch as will admit tillage ſoon after rain, and do not bake on hot gleams of ſun coming after heavy rains, when finely harrowed: ſuch land is better worth forty ſhillings an acre than many ſoils deſerve five. The next ſoil is that of the ſtiff loam, which is neareſt allied to brick earth; this, till drained, is in general an unkindly ſoil, without plenty of manure. It is known in winter by being very adheſive upon walking over it: is long in drying, even when little or no water is ſeen upon it; for which reaſon it is generally late in the ſpring before it can be ploughed. When quite dry it breaks up neither ſo hard and cloddy as mere clay, nor near ſo crumbly and mellow as the good loam. If it is in ſtubble, it is apt to be covered with a minute green moſs. There are many varieties of this ſoil, but all agree in moſt of theſe circumſtances; and in being what the farmers call poor, cold, hungry land. When hollow-ditched, and greatly manured, it yields any thing; but thoſe who hire it ſhould forget neither of theſe expenſes."

It is added, that "the gravelly ſoils are numerous in their kind, and very different in their natures. Warm, dry, ſound gravelly loams are eaſily diſtinguiſhed in winter. They admit ploughing all winter through, except in very wet times; always break up in a crumbly ſtate of running mould; and, if a ſtubble, will dig on trial by the ſpade, in the ſame manner. If under turnips, you may perceive, by walking through them, that it will bear their being fed off. The wet, cold, ſpringy gravel is a very bad ſoil; it is known in winter by the wetneſs of it; and in ſpring, by its binding with haſty ſhowers. It rarely breaks up in a crumbly ſtate, or ſhows

a mellowneſs under the ſpade. Very expenſive drains greatly correct its ill qualities, but it requires a prodigious quantity of manure to fertiliſe it. Some gravels are ſo ſharp and burning, that they produce nothing except in wet ſummers; but ſuch are known at any ſeaſon of the year. Sands are as various as gravels, and are all eaſily diſcoverable in their natures. The rich red ſand is, he believes, as profitable a ſoil as any in the world. It has at all ſeaſons a dry ſoundneſs, and at the ſame time a moiſture without wetneſs, which ſecures crops even in dry ſummers. The ſpade is ſufficient to try it at any ſeaſon of the year. The light ſandy loam is likewiſe an admirable ſoil: it will bear ploughing, like the preceding, all winter long, and appears quite ſound and mellow when tried with the ſpade. If it lies under a winter fallow, the beſt way to judge of its richneſs is to remark the ſtate of the furrows, and the degree of adheſion in the ſoil. Stiff land, being dry and crumbly, is a great perfection, and ſand, being adheſive, is an equally good ſign. When, therefore, the farmer views a light ſandy loam, whoſe ſound dryneſs is acknowledged, he may preſume the ſoil is rich, in proportion to its adheſion. If it falls flat in powder, and has no adheſion, it is a mere ſand. The white chalky marm is often cold and wet, will not bear ploughing in winter, unleſs the weather is very dry or froſty; runs exceſſively to mortar with a heavy ſhower when in a pulveriſed ſtate. It is a cold ſoil, of little profit, except with peculiar management; but anſwers beſt when dry laid down to ſaintfoin."

It is concluded, that "it ſhould be laid down in general as a maxim, that ſtrong, harſh, tenacious clay, though it will yield great crops of wheat, is yet managed at ſo heavy an expenſe, that it is uſually let for more than it is worth. Much money is not often made on ſuch land. The very contrary ſoil, a light, poor, dry ſand, is very often in the occupation of men who have made fortunes. Some permanent manure is uſually below the ſurface, which anſwers well to carry on: and ſheep, the common ſtock of ſuch ſoils, is the moſt profitable ſort he can depend on. All ſtiff ſoils are viewed to moſt advantage in winter: the general fault of them is wetneſs, which is in the greateſt exceſs at that ſeaſon of the year. If the fields are level, and the water ſtands in the land, notwithſtanding the furrows are well ploughed and open, it is a ſign that the clay is very ſtiff, and of ſo adheſive a nature as to contain the water like a diſh. It is likewiſe probable, that draining may prove inſufficient to cure the natural evil of ſuch land. This kind of ſoil likewiſe ſhows itſelf in the breaking up of ſtubbles for a fallow; a very ſtrong draught of cattle is then neceſſary to work it. It breaks up in vaſt pieces almoſt as hard as iron. When it is worked fine it will run like mortar, with a heavy ſpring or ſummer ſhower. Theſe ſoils will yield very great crops of beans and wheat, &c. They muſt, like others,

be cultivated by ſomebody; but he would adviſe every friend of his to have nothing to do with them; never to be captivated with ſeeing large crops upon the land; for he does not ſee at the ſame time the expenſes at which they are raiſed."

It is ſtated that "peat, bog, moor and fen in many variations are very profitable; but the expenſes of improvement demand a calculating head. The vicinity of lime or marl is then of great importance."

He ſays that, in reſpect to graſs lands, the marks for judgment are different. Theſe are beſt examined by attending, firſt, to the circumſtances in which they are moſt deficient; and then to ſuch as are in their favour. The more ſeaſons graſs fields are viewed in the better; though any one is ſufficient for a tolerable judgment. One evil attending theſe lands is, that of being too wet; the ſigns of which can never be miſtaken or overlooked in any ſeaſon of the year. In winter, it is at once perceived by walking on it; at all times of the year by the herbage which generally abounds on it; ſuch as ruſhes, flags, and a great quantity of moſs; and alſo by the colour of the graſs, which is moſtly blue at the points, ſometimes of a dirty yellow hue, and always coarſe. If the ſoil is the firſt deſcribed, ſtiff clay, and the ſurface level, the evil will be very difficult of cure; if of the other ſort of clay, or fliff loams, draining will have great effects. Graſs fields on gravelly ſoils are, if the gravel is ſharp, very apt to burn in dry ſummers: but they give great and ſweet crops in wet ones, provided the land is a gravelly loam. An abſolute gravel ſhould never be under graſs. A farmer ſhould not, however, regret having a paſture or two of this ſort in his farm, being of excellent uſe in winter for feeding ſheep and lambs on with turnips, &c. The low meadows, whatever the ſoil, on the banks of the rivers and brooks, are in general good, but often ſubject to the misfortune of being overflown in ſummer; which not only ruins crops of hay before they are cut, but carries them away perhaps when juſt made. Many graſs fields, on all ſoils, conſiſt of ſo bad an herbage as to be of little value; made up of weeds, and the worſt and coarſeſt of graſſes: if a landlord will not allow ſuch to be ploughed, the farmer ſhould minute the rent accordingly. This fault is viſible at all ſeaſons. A river that does not overflow, running through a farm, is a very favourable circumſtance, as it indicates a probability of all the graſs fields being well watered, that is, for cattle. And in many caſes it may be converted to the purpoſe of irrigating the land.

If the climate be mild, and the lands well ſheltered from the effects of the north and eaſterly winds by tracts of high grounds or woods of ſome extent, they are in many caſes circumſtances of a favourable kind, eſpecially where much of the farm is to be conducted under the grazing ſyſtem.

The ſituation of the land near towns, where the markets for the diſpoſing of their different products are good; and in many caſes near large cities, where the produce of ſeveral different ſorts can not only be diſpoſed of to much advantage, but manure in abundance be procured and brought back in return, is alſo a point that ſhould not be unattended to in the taking of a farm. And if lime, marl, or other ſubſtances capable of being made uſe of as manures, be near at hand, they are of great importance in the management of land, and ſhould have their due influence with the farmer in his fixing himſelf in a farm. Beſides theſe, there are various other local circumſtances and advantages, that may operate in different caſes with propriety in directing his conduct in the buſineſs of taking a farm.

It is a matter which Mr. Young juſtly conſiders of the greateſt conſequence in the engaging of a farm, that no larger a one be taken "than the ſum of money a man can command will ſtock properly. A common fault among farmers is, he ſays, the hiring too much land for their money: they are extremely eager to farm as much as poſſible; the certain conſequence of which is the conducting the ſoil in an imperfect manner. In the neighbourhood of great cities and towns, variety of manures are to be had, in ſome places cheap; but if the farmers have not money, how are they to make uſe of ſuch advantages? For theſe and other reaſons, a farmer ſhould not think of venturing on a tract of land which he cannot command, that is, farm as ſeems beſt to him."

It is obvious that a variety of advantages in the management of a farm muſt reſult from the different fields being connected, and not ſituated at a diſtance from each other: much time and trouble muſt conſtantly be ſaved, beſides many other conveniences being attained. It has been remarked by the above writer, that "many farmers too often overlook this circumſtance. If they attended to it, as much as their profit required, we ſhould ſee landlords reforming their eſtates in this particular more than many do at preſent. There is not a more expenſive, perplexing circumſtance in a farm, than the fields being in a ſtraggling, disjointed ſituation."

Where the exertions of the farmer are to be clogged with ſuch reſtrictive clauſes in the leaſe of a farm as muſt prevent him from cultivating it under the moſt advantageous method of huſbandry, there is every reaſon for his conſidering the matter well before he agrees for the farm, or he may find himſelf injured in a much greater degree than is eaſily conceived. The author of the Farmer's Calendar has obſerved, that "the merit or reaſonableneſs of covenants muſt be conſidered always on compariſon with the nature of the farm. It is for want of this conſideration that unreaſonable covenants are ever propoſed. Theſe prohibitions are

fooliſh, but ſometimes admiſſible: they muſt depend on local circumſtances, to be well weighed by the farmer who hires." "The principal point here neceſſary to touch on, is the combination of rent, tithes and rates, in one ſum. Knowing the capital intended to be inveſted, eſtimate the intereſt of it at not leſs than 10 per cent. and then calculate the expenſes and produce; the former deducted from the latter leaves that ſum which the farmer can afford to pay in theſe three ſpecies of rent. Deduct further the tithes and rates, and the remainder is what he can afford to pay to the landlord. If rent be valued in any other way, it muſt, he ſays, be erroneouſly and deceitfully done, and no dependence can be placed on it."

The mode of paying the rent may likewiſe in ſome inſtances demand the notice of the farmer in engaging a farm.

In the ſtocking of farms there will be conſiderable difference according to their nature, ſituation, and manner in which they are conducted; but an adequate capital ſhould always be employed, or there will be great loſs ſuſtained. It has been obſerved by Mr. Young, that "thirty years ago, the ſum that was uſually appropriated to ſtocking a farm varied from 3l. to 5l. an acre; and it was a general idea, that the latter ſum was ſufficient for any farm, part arable and part graſs, of no uncommon fertility. Rich marſhes were, of courſe, excluded in the calculation; and light ſtock farms were often ſtocked for 3l. per acre. But theſe matters are now greatly changed; rents are much increaſed; tithes are compounded at a higher payment; poor rates are enormouſly riſen; all ſorts of implements, comprehended in the article wear and tear, are thirty or forty per cent. dearer; labour is in many diſtricts doubled; the prices of cattle and ſheep are greatly advanced; ſo that at preſent the ſame farm which at that period would have been very well ſtocked, and the firſt year's expenſe provided for at the rate of 5l. per acre, now demands from 7l. to 8l. per acre. In all ſuch eſtimates it is, he ſays, neceſſary to ſuppoſe that every implement bought in is new, that the live ſtock be good of the ſort, and that the firſt year's expenſes be provided for, though a portion of the crop may come in before the whole payment is made. A man cannot be at his eaſe if he does not thus provide; nor will he be able to make that profit by his buſineſs with a ſmall capital, which will attend the employment of a larger. By profit he would be underſtood to mean a per centage on his capital, which is the only ſatisfactory way of eſtimating it. If by ſtocking a farm with 5l. per acre, he makes 7 or 8 per cent. profit; and by ſtocking in proportion of 8l. per acre, he makes ten per cent. (and this difference will, he believes, often be found), it muſt be ſufficiently apparent that the loſs by the ſmaller

ſtock is a ſerious evil. It will depend much on ſituation and local circumſtances; the benefit of procuring manures, or litter to make dung, may in ſome places be very great, in others much leſs: but not to be able to profit by every favourable opportunity that may attend the ſpot on which a farmer is fixed, muſt be highly diſadvantageous. To irrigate land is an expenſive operation; but to omit or poſtpone it, for want of money for the undertaking, is to loſe perhaps the capital advantage of a farm. Caſes of this ſort might be greatly multiplied; and there is not one that does not call on the farmer for an ample capital."

The ſame able author juſtly remarks, that "of all farms, a warren is hired with the ſmalleſt capital; but that there are marſhes in Lincolnſhire ſtocked at the rate of above 30l. per acre. And the annual expenſe of many hop-grounds amounts to 30l. and the capital above 60l."

He ſuppoſes that "if a farmer does not make ten per cent. on his capital, he muſt either have a bad farm or bad management, or the times muſt be unfavourable. He ought, he thinks, to make from twelve to fifteen per cent. Some farmers make more, when corn is at a fair price."

Beſides proper attention being beſtowed in theſe different reſpects, the farmer ſhould conſtantly take care that the live ſtock be of ſuch kinds as are beſt adapted to the nature and ſituation of the land, as, without due regard in this particular, great loſs may be conſtantly ſuſtained. It is never adviſable for him to have recourſe to the more fine or faſhionable breeds, except where the nature of the ſoil is well ſuited to them, and other conveniences fully juſtify their introduction.

To be read after Line 18, *Page* 836.—The *Birds-foot Trefoil* has been found uſeful for cultivation in meadows which are inclined to moiſture, as growing to a great height, and affording good hay. It is cultivated in Herefordſhire as paſturage for ſheep*.

* Withering's Botanical Arrangement.

AN APPENDIX,

AN APPENDIX,

CONTAINING

A COMPENDIOUS VIEW

OF

THE PRINCIPAL LAWS

RELATING TO

AGRICULTURE.

CHAPTER I.

Of the RELATIVE RIGHTS of LANDLORD and TENANT, including a concise Statement of the Doctrine respecting Leases.

THE relation between landlord and tenant, or, technically ſpeaking, the leſſor and leſſee, ariſes upon a contract for the poſſeſſion and profits of lands or other hereditaments on the one ſide, and a recompence by rent * or other conſideration on the other. *Sheppard's Touchſtone*, 267; 2 *Blackſtone's Commentaries*, 317; 1 *Term Reports*, 598-9.

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* But there is no occaſion for the rent to be, as it uſually is, a ſum of money; for ſpurs, capons, horſes, corn, and other matters, may be rendered, and frequently are rendered, by way of rent. *Coke Littleton*, 142; 2 *Blackſtone's Commentaries*, 142.

And it is to be obſerved, that if in a renewed hoſpital, or other leaſe, the reſervation be of *ſo many quarters of corn*, this ſhall be underſtood to mean legal quarters, reckoning the buſhel at eight gallons, although the old leaſes before the ſtat. 22 and 23 *Car.* 2, c. 12, contained the ſame reſervation; and although in fact the tenants, or leſſees, never paid in kind, but by compoſition, reckoning the buſhel at a cuſtomary meaſure of nine gallons or more, for the parties having made uſe of the term quarters, the court muſt conſtrue the leaſe according to the law exiſting, when the leaſe was made, and by the poſitive reſtrictions in the above act of parliament, the buſhel is now to contain eight gallons, and no more, 6 *Term Reports*, 333.

And this contract may be entered into either by parol, that is by verbal, agreement, or by deed, or other inſtrument in writing.

It is, however, neceſſary to obſerve, that a diſtinction has been eſtabliſhed between theſe two modes of contracting, by an act of parliament, moſt generally known by the name of the ſtatute of frauds and perjuries: by which (*29 Car. 2. c. 3.*) it is enacted, that "all leaſes, eſtates of freehold, or terms for years, of any uncertain intereſts, of, in, to, or out of, any meſſuages, lands, tenements, &c. *not put into writing, ſhall have the force and effect of eſtates at will only, and ſhall not, either at law, or in equity, be taken to have any greater effect:* except only leaſes, not exceeding three years from the making, whereupon the rent reſerved, ſhall be at leaſt two-thirds of the improved value.

TENANT AT WILL.]—A tenant at will is one to whom another lets lands without limiting any certain or determinate eſtate. *Littleton, ſec. 68.*

And a parol or verbal agreement to leaſe lands for a term exceeding three years, creates only a tenancy at will, for the ſtatute of frauds is expreſs that ſuch an agreement ſhall only have the effect of creating a tenancy at will. 4 *Term Reports*, 680.

And all leaſes for uncertain terms are *prima facie* leaſes at will: but if there be a reſervation of an annual rent, that turns them into leaſes from year to year. 2 *W. Blackſtone*, 117.

Thus a parol demiſe for more than three years, at an annual rent, now operates as a tenancy from year to year, the meaning of the ſtatute of frauds being, that ſuch an agreement ſhall not operate as a term: and what was conſidered at the paſſing of that as a tenancy at will, has ſince been properly conſtrued to endure as a tenancy from year to year. 8 *Term Reports*, 3.

So a general parol or verbal demiſe, at an annual rent, where the bulk of the farm is encloſed, and a ſmall part in the open common fields, is only a leaſe from year to year, and not for ſo long as the uſual round of huſbandry extends: in this caſe it was contended, that as part of the farm was open field land, and the term uncertain, it ought, for the benefit of agriculture, to be conſidered, according to the uſual round of the huſbandry of the place, to be a holding from three years to three years. But the court ſaid, that although a *ſpecial* agreement of this kind might be very prudent and reaſonable, and would be good in law, yet all the caſes from king *Henry* VIII. (when encloſures were little known) to the preſent time, determine ſuch takings, or holdings over, to be only leaſes for one year: that where the courſe of huſbandry is not finiſhed under four years, as in Berks, and other rich counties, a general parol taking cannot be conſtrued to be a leaſe for four years conſiſtently with the ſtatute of frauds *. 2 *W. Blackſtone*, 117.

And a tenancy at will, now conſidered as a tenancy from year to year, by the reſervation of an annual rent, as above mentioned, may be created either by expreſs words, as where one lets land to another, as long as both parties ſhall agree, or if a man enters and enjoys land by conſent of the owner, he ſhall be tenant at will to him, though there be not any expreſs leaſe at will, for he enters and has the land by conſent. *Littleton, ſec. 70*; 1 *Rolle's Abridgment, l. 21*; *Raymond*, 147; 8 *Term Reports*, 3.

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* The court ſaid, that it might be poſſible, that circumſtances may make it a leaſe for a longer term as where the crop (ſuch as liquorice, madder, or the like) does not come to perfection in leſs than two years.

Alſo, in the caſe of a tenancy from year to year, as long as both parties pleaſe, if the tenant die inteſtate, his adminiſtrator has the ſame intereſt in the land which his inteſtate had, and may bring an ejectment againſt the landlord. 3 *Term Reports*, 13.

And a tenancy from year to year cannot be put an end to, or determined, without reaſonable notice from the one party to the other. 3 *Burrowes*, 1609.

Therefore, if the landlord brings an ejectment for lands ſo let at will, he muſt prove that *half a year's previous notice or warning was given to the tenant, or to his executor, in caſe of his death,* or the plaintiff will be nonſuited at the trial. 3 *Wilſon*, 25.

And the ſix months' notice or warning to quit, cannot be given on any quarter-day; but only on that which is ſix months previous to the day on which the tenant firſt entered. 1 *Term Reports*, 159.

Neither can a tenant from year to year quit at any other quarter than that in which the year expires; and he muſt give ſix months' previous notice in like manner to the landlord, as in the laſt-mentioned caſe.

And the notice from the landlord muſt be poſitive, and not leave an option in the tenant to quit, or to hold over on certain terms; ſuch as, "I deſire you to quit at Lady-day next, unleſs you agree to pay double rent:" but if the words be, "*or* I *ſhall* inſiſt on double rent," it is otherwiſe, and the notice is good, becauſe the latter words are added as a threat, which may be waived, and the former leave an option to the tenant. *Douglas*, 167.

But a notice to quit is not neceſſary where the tenant has attorned, that is, has acknowledged himſelf to be tenant to a third perſon, in contravention of his landlord's title, or where he denies to hold as mere tenant to the landlord. *Buller's Niſi Prius*, 96.

If the landlord receives rent which becomes due *after the expiration* of the notice to quit, it is not of itſelf a waiver of the notice; and if an ejectment be brought to recover the lands for not quitting in purſuance of the notice, it will at the trial be left to the jury to conſider with what intention the rent was received, as it may be *a waiver only of the double rent* *, to which the landlord may be entitled, or he may have taken it under the terms, that it ſhould not be conſidered as a waiver of the notice.

TENANT UNDER A LEASE IN WRITING.]—Leaſes exceeding the term of three years muſt be in writing, as before obſerved; but no preciſe form of words is eſſential to conſtitute a good leaſe; for whatever words are ſufficient to explain the intent of the parties, that the one ſhall diveſt himſelf of the poſſeſſion, and the other come into it, for ſuch a determinate time, ſuch words, whether they run in the form of a LICENCE—COVENANT—or AGREEMENT, are of themſelves ſufficient, and will in conſtruction of law amount to a leaſe for years, as effectually as if the moſt proper and per-

* By the ſtat. 11. *Geo.* 2. *c.* 34. *ſec.* 18. In caſe any tenant ſhall give notice of his intention to quit the premiſes, and ſhall not accordingly deliver up the poſſeſſion at the time in ſuch notice contained, the ſaid tenant, his executors, or adminiſtrators, ſhall pay to the landlord *double the rent which he would otherwiſe have paid*; and it has been determined, that the notice by the tenant to quit under the above ſtatute need not be in writing, but that a parol or verbal notice to quit is ſufficient. 3 *Burrowes*, 1603

tinent words had been made use of for that purpose. *Bacon's Abridgm. Tit. Leases* (K); *Croke, Eliz.* 484; *Rolle's Abridgm.* 847; *Moor*, 459; *Noy*, 57; 2 *W. Blackstone*, 973.

But the usual words to make a lease are, according to the most approved precedents, *demise, lease, sett, and to farm let.*

And as a lessee or tenant for years may assign or grant over his whole interest, so he may grant it for any fewer or less number of years than he himself holds it; and such derivative or under lessee is compellable to pay rent, perform covenants, &c. according to the terms agreed on in such grant or agreement. *Bacon's Abr. Tit. Leases* (I) 3.

After these preliminary observations, it is necessary to shew by whom leases may be granted:

I. *A tenant in fee simple* may make leases without limitation or restraint, having an absolute and unlimited interest. *Comyn's Dig. Tit. Estates* (G) 2.

II. So *a tenant in tail* may make a lease for his own life, and by the stat. 32 *Hen.* 8, *c.* 28, he may make leases for three lives, or twenty-one years, to commence from the making, or some short time after, provided the lands leased have been usually letten to farm for twenty-one years past, and the accustomed yearly rent paid within that period be reserved, the intent of the statute being that the tenant in possession shall not diminish the value of the estate to the person entitled in reversion.

III. All *husbands* seised of lands in right of their wives are enabled by the same stat. 32 *Hen.* 8, *c.* 28, to make leases for twenty-one years, or three lives in being, to commence from the time of making the lease, observing the directions therein contained, which are the same as in respect to tenants in tail; which leases bind the wives and their heirs, so that they cannot now, after the husbands' death, avoid such leases, as they might have done before the above statute at the common law. *Bacon's Abridgm. Tit. Leases* (C).

And if the directions in the statute are not observed, then the common law takes place, and the wives and their heirs are at liberty to avoid such leases, in the same manner as they might have done before. *Ibid.*

Also in all such leases the wife ought to be made a party.

IV. Although either a *tenant in dower*, or by the *curtesy* of England *, may make a lease for years, reserving rent; yet if such tenant die before the expiration of the term granted, the lease is absolutely determined, and no acceptance of rent by the heir or those in reversion can make it good. *Croke Car.* 398; *Jones*, 254; *Vaughan*, 81.

V. Also *tenants for life* may grant leases of their lands for their own lives, or the life of the person on whose death the estate will determine, but no longer, unless there be a power reserved in the deed or instrument under which they are entitled, granting them liberty to demise for a longer term: and even in that case it is to be observed, that if the lease varies from the conditions, limited in the power of leasing in any respect whatsoever, either as to the interest demised, the rent reserved,

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* If a man takes a wife seised in fee, or in tail, by whom he has issue born alive, though such issue may die immediately, he shall hold, by the curtesy of England, the lands after the death of his wife for life. *Littleton, sec.* 35; *Coke Littleton*, 296; 8 *Coke's Reports*, 356.

or the mode of executing the power, ſuch leaſes upon the death of the tenant for life are void, and cannot be ſupported againſt the heir, or thoſe next in remainder.

If the tenant for life has no power to grant leaſes by the deed or other inſtrument under which he is entitled, it is uſual to make the leaſe for a definite and certain number of years, *if he* (the tenant for life) *ſhall ſo long happen to live.*

VI. Alſo *joint tenants* and *tenants in common* may grant leaſes for life or years, or at will, either of the whole eſtate or of their ſeveral ſhares or moieties therein; and ſuch leaſes will at the death of the one, bind the other who may ſurvive, becauſe it is a preſent diſpoſition of an immediate intereſt, and binds the land from the time of the leaſe made. *Coke Lit.* 163; *Rolle's Abridgm.* 848; *Coke Lit.* 186.

And the reaſon that the leaſe for years of one joint tenant of his moiety, is good and binding againſt the ſurvivor, is, that theſe joint tenants, having a reciprocal intereſt in each other's life, when one of them makes a leaſe for years of his moiety, this does not depend for its continuance on his life only, but on his life and the life of the other joint tenant, whether either of them ſhall live longeſt, according to the nature and continuance of the eſtate whereout it was derived; and then ſo long as that continues, ſo long the leaſe holds good; and by conſequence ſuch leſſee ſhall hold out the ſurviving joint tenant, and the reverſioner, till the eſtate, whereout his leaſe was derived, be fully determined. *Bacon's Abridgm. Tit. Leaſes* (I) 5.

But it is ſaid, that if a rent were reſerved on ſuch leaſe, this is determined and gone by the death of the leſſor, for the ſurvivor cannot have it, becauſe he comes in by title paramount to the leaſe; and the heirs of the leſſor have no title to it, becauſe they have no reverſion and intereſt in the land. *Coke* 96; *Coke Lit.* 185, *a*; *Moor*, 139.

However it rather ſeems at this day, that the executors or adminiſtrators might maintain an action of debt or covenant, either upon the covenant in law, or expreſs covenant, for payment of the rent, and ſo become anſwerable over to the ſurviving joint tenant; or perhaps a court of equity would under ſuch circumſtances interfere.

And to obviate any ſuch difficulty, it is adviſable that the leaſe granted by a joint tenant, of his part or moiety, ſhould be made to continue for a certain term of years, "if the *eſtate and intereſt of the ſaid joint tenant of or in the demiſed premiſes ſhall ſo long continue.*"

Alſo if one joint tenant or tenant in common makes a leaſe for years of his part to his companion, this is good; for this only gives him a right of taking the whole profits, when before he had but a right to the moiety thereof; and he may contract with his companion for that purpoſe as well as he may with any ſtranger. *Coke Lit.* 186, *a*; *Croke Jac.* 83, 611; *Moor*, pl. 194; *Rolle's Abridgm.* 851; 1 *Rolle's Abridgm.* 877.

VII. Likewiſe *eccleſiaſtical perſons* and *eleemoſynary corporations* may, by the ſtat. 32 *Hen.* 8, *c.* 8, already noticed *, make leaſes under a condition that this power is not to extend to leaſes of lands in farm by virtue of any old leaſe, unleſs ſuch old leaſe be expired, ſurrendered, or ended, within one year after making of a new leaſe;—nor to a grant of any reverſion of lands;—nor to a leaſe

* Amended by 1 *Eliz. c.* 19; 13 *Eliz. c.* 10; 14 *Eliz. c.* 11; and 39 and 40 *Geo. 3. c.* 41.

of lands not moſt commonly letten by the ſpace of twenty years before;—nor to a leaſe without impeachment of waſte;—nor to a leaſe above twenty-one years, or three lives, from the day of making—and that on ſuch leaſe there be reſerved the moſt accuſtomably paid rent for the ſame within twenty years next before.

VIII. *Executors and adminiſtrators*, as they may diſpoſe abſolutely of *terms for years* veſted in them in right of their teſtators or inteſtates, ſo may they leaſe the ſame for any fewer number of years; and the rent reſerved on ſuch leaſes ſhall be aſſets in their hands, and go in a courſe of adminiſtration. 6 *Coke*, 63, 67, *b*; *Bacon's Abridgm. Tit. Leaſes* (I) 7.

IX. But MORTGAGORS cannot in ſtrictneſs grant leaſes of the lands which they have previouſly mortgaged, unleſs the mortgagee be made a party. Therefore a mortgagee may recover in ejectment, without giving notice to quit, againſt a tenant who claims under a leaſe from the mortgagor, granted after the mortgage, without the privity of the mortgagee. 1 *Douglas*, 21.

Alſo a mortgagee after giving notice of the mortgage to the tenant in poſſeſſion under a leaſe *prior to the mortgage*, is entitled to the rent in arrear at the time of the notice, as well as what accrues afterwards; and he may diſtrain for it after ſuch notice. 1 *Douglas*, 278.

X. Alſo a COPYHOLDER cannot without licence from the lord make a leaſe for a longer period than one year, unleſs warranted by the cuſtom. *Moor*, 184. *Salk.* 186.

It is, however, ſaid by a reſpectable author, that the copyholder may, by a covenant, permit the leſſee to enjoy from year to year for a certain definite term, or inſure the poſſeſſion of the leſſee for any given period. But the authority which he cites (2 *Croke*, 301) is directly the reverſe; for that caſe lays it down, that this would be in effect a leaſe for the whole term intended, and a forfeiture of the copyholder's intereſt *.

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* In the above obſervation it is not intended to queſtion the judgment or learning of the author, but he certainly is too indefinite in what he has laid down; for the only mode in which the poſſeſſion of the tenant of copyhold premiſes can be in any degree aſſured to him beyond the term of one year, is, by making a leaſe with the following form of words in the habendum: "To HAVE AND TO HOLD "all and ſingular the ſaid demiſed premiſes, and every part and parcel thereof, with their and every "of their appurtenances, unto the ſaid A B, his executors, adminiſtrators, and aſſigns, from ——— "*unto the full end and term of one whole year*, and ſo from year to year until the expiration of the "term of ——— years, from the ſaid ——— day of ———, *if the lords, lady, or ladies of the "manor or manors whereof the ſame demiſed premiſes are holden, ſhall conſent thereunto, and if, according "to the cuſtom or cuſtoms of the ſaid manor or manors, the ſame may be ſo demiſed without prejudice or "forfeiture, but not otherwiſe*, YIELDING AND PAYING," &c. as in other leaſes, obſerving to let the covenants run in the following words, viz. *During the continuance of the ſaid term from year to year as aforeſaid.*

CHAP. II.

FORMS of LEASES, with Notes illuſtrative of the Operation and Effect of the Covenants.

I. *The Leaſe of a Farm for Twenty-one Years, with Covenants directing the Courſe of Huſbandry, according to the Weſtern Practice.*

THIS Indenture, made the ——— day of ———, in the ——— year of the reign of our ſovereign Lord George the Third, by the grace of God of the united kingdom of Great Britain and Ireland, king, defender of the faith, and ſo forth, and in the year of our Lord God, 1803, between Andrew Atkins, of ———, of the one part, and Bartholomew Bell, of ———, of the other part, witneſſeth, that in conſideration of the yearly rent, covenants, conditions, and agreements hereinafter contained, and on the part of the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, to be paid, done, kept, and performed, the ſaid Andrew Atkins HATH demiſed, leaſed, ſett, and to farm let, and by theſe preſents DOTH demiſe, leaſe, ſett, and to farm let, unto the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, all that meſſuage, tenement, and farm, with the appurtenances, commonly called or known by the name of ——, ſituate, lying, and being within the pariſh of ———, in the ſaid county of ———, now in the tenure or occupation of the ſaid Bartholomew Bell, as tenant to the ſaid Andrew Atkins, together with all houſes, out-houſes, edifices, buildings, barns, ſtables, courts, curtilages, gardens, orchards, lands, meadows, paſtures, feedings, ways, paths, waters, water-courſes, eaſements, profits, commodities, emoluments, and appurtenances whatſoever to the ſaid meſſuage, tenement, and farm, or any part thereof, belonging or in any wiſe appertaining (except* and always reſerved out of this preſent demiſe unto the ſaid Andrew Atkins, his heirs and aſſigns, all quarries and mines whatſoever, open or unopened, and all and all manner of timber trees and young trees and ſaplings likely to become timber, of what nature or kind ſoever, now ſtanding, growing, or being, or which hereafter ſhall ſtand, grow, or be, in or upon the ſaid demiſed premiſes or any part thereof, with full and free liberty to and for the ſaid Andrew Atkins, his heirs and aſſigns†, and his and their ſervans,

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* The landlord cannot enter in order to work mines, fell timber, or the like, without an expreſs covenant allowing him to do ſo; for *particular* advantages belonging to ſome leſſors only, and not to all (ſuch as the right to enter to ſee the ſtate of repairs), muſt be provided for by particular agreement. *Coke Lit.* 54.

† If the leſſor or landlord holds only intermediately under a ſuperior leaſe from another, any reſervation or exception as to part of the premiſes demiſed, and all the covenants where his name is mentioned, muſt run in the words *his executors, adminiſtrators, and aſſigns*, inſtead of "his

agents, and workmen, to enter into and upon, and paſs and repaſs at all ſeaſonable times in the day time, upon, over, and through the ſaid demiſed premiſes for the felling, rooting up, and working and planting ſuch trees and ſaplings, and opening, ripping, digging, and drawing the ſtones and minerals in ſuch mines and quarries, and taking and carrying away the ſame with any manner of carriages whatſoever at the free will and pleaſure of the ſaid Andrew Atkins, his heirs or aſſigns, doing no wilful waſte or ſpoil), to have and to hold the ſaid meſſuage, tenement, and farm, and all and ſingular the premiſes hereby demiſed or mentioned and intended ſo to be, with their and every of their appurtenances (except as before excepted), unto the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, from the ——— day of ——— now next enſuing, for and during and unto the full end, term, and time of twenty-one years from thence next enſuing, and fully to be complete and ended; yielding and paying therefore yearly and every year during the ſaid term hereby demiſed unto the ſaid Andrew Atkins, his heirs or aſſigns, the rent or ſum of ——— pounds, of lawful money of Great Britain, by even and equal half-yearly payments in each and every year, at or upon the two moſt uſual feaſts or days of payment of rent hereinafter mentioned (that is to ſay), the ——— day of ——— and the ——— day of ——— in each and every year, the firſt of the ſaid half-yearly payments to be made on the ——— day of ——— now next enſuing. PROVIDED ALWAYS, and it is hereby declared and agreed by and between the parties to theſe preſents, that if it ſhall happen that the ſaid yearly rent or ſum of ——— pounds, or any half-yearly payment of the ſame, ſhall be behind and unpaid in the whole or in part by the ſpace of twenty-one days next after either of the ſaid feaſts or days of payment whereon the ſame ought to be paid as aforeſaid, *and the ſame ſhall be demanded on the expiration of the ſaid twenty-one days or at any time afterwards* *, and not paid at the time of ſuch demand, that then and from thenceforth it ſhall and may be lawful to and for the ſaid Andrew Atkins, his heirs and aſſigns, into and upon all and ſingular the demiſed premiſes with the appurtenances, or into and upon any part thereof, in the name of the whole, to re-enter and the ſame to have again, re-poſſeſs, occupy, and enjoy, as if theſe preſents had not been made, theſe preſents or any thing in them contained to the contrary thereof in any wiſe notwithſtanding. AND the ſaid Bartholomew Bell doth hereby for himſelf, his heirs, executors, adminiſtrators, and aſſigns, covenant, promiſe, and agree, to and with the ſaid Andrew Atkins, his heirs and aſſigns, that he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall and will from time to time well and truly pay, or cauſe to be paid, unto

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heirs and aſſigns," which latter words are only to be uſed where the leſſor or landlord is entitled to the fee ſimple and freehold, and not to a ſmaller eſtate carved out of the inheritance, ſuch as a leaſehold or term for years is.

* In conſequence of the deciſion in *Doe v. Windlaſs*, 7 *Term Rep.* 117, in which it was determined, that under a power of re-entry in caſe of non-payment of rent, the landlord cannot recover in ejectment at common law, unleſs he prove a demand on the very day on which the rent became due; nor under the ſtatute of 4 *Geo.* II. *c.* 28, unleſs he prove that there was not a ſufficient diſtreſs on the premiſes; it has been conſidered by conveyancers as adviſable to introduce in the clauſe empowering the leſſor or landlord to re-enter, the above words diſtinguiſhed by *Italics*.

the ſaid Andrew Atkins, his heirs or aſſigns, the ſaid yearly rent or ſum of ———— pounds, at the days and times and in manner and form herein before limited and appointed for payment of the ſame, according to the reſervation hereby made thereof, and the true intent and meaning of theſe preſents. And alſo, that he the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, ſhall and will carry into and upon every acre of the ſaid hereby demiſed premiſes which he or they ſhall till or break up for tillage, and in that proportion for every leſs quantity than an acre, except upon four cloſes of land, parcel of the ſaid hereby demiſed premiſes, called or known by the names of A, B, C, and D, ———— dozen buſhels of good and well-burnt ſtone lime, and there lay, mix with the earth and ſoil, ſpread, caſt abroad, and manure or dreſs every ſuch acre, and ſo in proportion, according to good huſbandry; and that he the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, ſhall and will carry into and upon every acre of the ſaid four cloſes of land, called A, B, C, and D, that he or they ſhall till or break up to or for tillage, and in that proportion for every leſs quantity of the ſame cloſes than an acre, ———— buſhels of good and well-burnt ſtone lime, and there lay, mix with earth and ſoil, ſpread, caſt abroad, and manure or dreſs every ſuch acre, and ſo in proportion, according to good huſbandry; and that he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, upon or after ſuch manuring or dreſſing, ſhall and will have and take three crops and no more of any kind of corn or grain, and thoſe ſucceſſively one year after another, without the intermiſſion of any year; and that only one of ſuch crops, and that not the laſt, ſhall be of wheat, and the other of barley or oats, or one of the one ſort and the other of the other ſort, and ſhall not nor will break up or till any part of the ſaid premiſes for more than two courſes of tillage (computing three crops of corn and grain to a courſe of tillage) during the ſaid term. And alſo, that he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall or will, with the ſeeds of corn or grain to be ſown in the Lent ſeaſon of the laſt year, before the end of the ſaid term hereby demiſed, ſow, or cauſe to be ſown, at leaſt ſix pounds of good new clover, and two pecks of the beſt new graſs ſeeds, on each and every acre, and harrow, bruſh in, and cover the ſame clover and graſs ſeeds according to the courſe of accuſtomed uſual and good huſbandry: and that he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall not, nor will permit or ſuffer the graſs which ſhall ariſe or grow from ſuch clover and graſs ſeeds to be eaten or trodden down after Chriſtmas-day in the laſt year of the ſaid term, nor to be eaten too cloſe or otherwiſe injured contrary to the accuſtomed and uſual rules of good huſbandry, at any time after the ſeeds ſhall be ſown. And alſo ſhall not, nor will have or take more than one crop of potatoes in one field in any ſeven years during the ſaid term hereby granted. And alſo, that it ſhall and may be lawful to and for the ſaid Andrew Atkins, his heirs or aſſigns, at any time after the firſt day of Auguſt next preceding the end or determination of the ſaid term, at his and their own election, to enter into and upon and thwart over, break up, and plough any one field not exceeding —— acres of ground, part of the ſaid demiſed premiſes, and to make breaches and fallow for wheat, and to till the ground ſo thwarted, eared, broken up, and ploughed, and to hold the ſame from and after the thwarting, earing, breaking up, and ploughing thereof, from thenceforth, for and during all the reſt and reſidue of the ſaid term, without making any deduction, allowance, or recompence, in reſpect thereof. And alſo, that he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall not nor will cut or mow, or ſuffer to be cut or mown, any

of the grafs arifing from the clover or other grafs feeds which fhall be fown in any part of the faid demifed premifes oftener or more than once, and only in the next enfuing feafon of the year for that purpofe, after the ground fown with fuch clover or other grafs feeds fhall be left out of tillage. And alfo fhall not, nor will cut or mow, or fuffer to be cut or mown, the grafs of any part of the faid premifes, except the meadow ground, and fuch ground as is or fhall be fown with grafs feeds as aforefaid; nor till or break up for tillage any part of the meadow ground during the faid term; nor cut or mow the grafs of the fame oftener than once in any year during the faid term. And that he the faid Bartholomew Bell, his executors, adminiftrators, and affigns, fhall not nor will cut any hedge or hedges of or belonging to the faid hereby demifed premifes but in the proper feafon of the year for that purpofe, and not under feven years' growth, and fuch hedges as adjoin to arable ground only when the ground adjoining thereto on one fide at leaft fhall be in tillage for the firft crop after a new breach, and fhall and will at the time leave fufficient growth in the hedges to cut, and upon and immediately after fuch cutting fhall and will caft, load, flope down, and new-make the hedges fo cut on both fides, according to accuftomed ufual and good hufbandry. And alfo fhall and will from time to time and at all times during the faid term, well and fufficiently repair, amend, and in good tenantable condition put, maintain, and keep all the hedges and the glafs of the windows, and alfo the gates, bars, ftiles, and pofts of or belonging to the faid demifed premifes, having timber requifite and neceffary for that purpofe by the affignment or delivery of the faid Andrew Atkins, his heirs or affigns, and at the end, expiration, or other fooner determination of the faid term, the faid hedges, glafs of the windows, gates, ftiles, bars, and pofts in good and fufficient repair, fhall and will leave and yield up (reafonable ufe and wearing thereof in the mean time always allowed). And alfo fhall not nor will cut, top, or lop any tree or trees on the faid premifes hereby demifed, but fuch trees as have been topped, and thofe only in the proper feafon of the year for that purpofe, and not in an improper manner, nor under feven years' growth, nor do, or permit and fuffer to be done, any wafte, fpoil, or deftruction in or upon the faid demifed premifes or any part thereof during the faid term, nor demife, leafe, fet, let, or part with the poffeffion of the faid premifes for any longer term than one year, and that to pafture only, without the previous confent and authority of the faid Andrew Atkins, his heirs or affigns, for that purpofe firft had and obtained in writing. And alfo, that he the faid Bartholomew Bell, his executors, adminiftrators or affigns, fhall not nor will carry off from the faid premifes any muck, dung, foil, afhes, compoft, or other manure, or any hay, ftraw, or corn in the ftraw, which fhall arife, be made, grow, or be produced thereon during the faid term; but on the contrary fhall and will yearly, and every year, during the faid term hereby demifed, at the moft feafonable times, and according to the due and accuftomed courfe of hufbandry, lay and fpread on fome part or parts of the land hereby demifed and where moft neceffary, all fuch muck, dung, foil, afhes, compoft, or other manure as fhall from time to time arife, be made, or produced upon the faid demifed premifes or any part thereof; and alfo fhall and will yearly, and every year, during this demife, fodder out, fpend, and confume into dung with neat beafts and other cattle in an hufbandlike manner, on fome part or parts of the premifes hereby demifed, where moft convenient or neceffary, all the hay, ftraw, chaff, fodder, and clover that fhall during the faid term hereby demifed from time to time arife, grow, or be produced upon or from the faid demifed premifes or any part or parts thereof. And

ALSO, that he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall and will, during the ſaid term hereby demiſed, well and truly pay, diſcharge, and ſatisfy, or cauſe to be paid, diſcharged, and ſatisfied, the great and ſmall tythes, and the houſe, window, and all other taxes and aſſeſſments whatſoever, whether parliamentary or parochial, the land tax only excepted, and do and perform or cauſe to be done and performed the ſtatute labour on the highways, or pay the compoſition money for the ſame, which ſhall become due or payable in reſpect thereof, to be done and performed. AND ALSO that he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall and will live and reſide in the dwelling-houſe part of the ſaid demiſed premiſes during the ſaid term hereby granted. AND he the ſaid Andrew Atkins doth hereby for himſelf, his heirs, and aſſigns, covenant, promiſe, and agree to and with the ſaid Bartholomew Bell, his executors, adminiſtrators and aſſigns, in manner following, (that is to ſay) that he the ſaid Andrew Atkins, his heirs and aſſigns, ſhall and will pay and diſcharge, or otherwiſe deduct and allow out of the rent hereby reſerved, the land tax, which ſhall be paid by the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, for or in reſpect of the ſaid demiſed premiſes, during the ſaid term hereby demiſed; and alſo ſhall and will ſufficiently repair, amend, and in good tenantable condition maintain and keep, the ſaid meſſuage or tenement, out-houſes, and buildings in the main and principal walls, and the roofs and tiling of the ſame and every of them, in all needful and neceſſary reparations whatſoever, when and as often as need or occaſion ſhall require during the ſaid term of twenty-one years; and he and they ſhall be thereunto requeſted by the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, by ——— months previous notice or warning in writing for that purpoſe, under his or their hand or hands: and alſo ſhall and will find and provide good and ſufficient timber for repairing the gates, bars, ſtiles, and poſts, belonging to the ſaid demiſed premiſes; AND FURTHER, that it ſhall and may be lawful to and for the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns (well and truly paying the rent hereby reſerved, and obſerving, fulfilling, performing, and keeping all and every the covenants, conditions, and agreements herein contained on his and their parts and behalves to be obſerved, fulfilled, performed, and kept), from time to time and at all times hereafter during the ſaid term hereby demiſed, peaceably and quietly to have, hold, uſe, occupy, poſſeſs, and enjoy all and ſingular the ſaid demiſed premiſes with the appurtenances (except as before excepted), without the let, ſuit, trouble, moleſtation, denial, or eviction of him the ſaid Andrew Atkins, his heirs or aſſigns, or any perſon or perſons lawfully claiming or to claim the ſaid premiſes or any part thereof, by, from, or under him, or them, or any of them, and without the let, ſuit, trouble, moleſtation, diſturbance, denial, or eviction of any other perſon or perſons whomſoever *. In witneſs, &c.

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* By 11 *Geo.* II. *c.* 19, *ſ.* 12, where an ejectment is ſerved on any lands, if the tenant does not give notice to the perſon of whom he holds, of the ſervice of ſuch ejectment, he ſhall forfeit three years' rent of the premiſes, to be recovered by action of debt.

Form of a Leaſe of a Farm in the Midland Diſtrict for Twenty-one Years, commencing as to ſeveral Parts at different Periods, and ſubject to Rents and Reſervations.

THIS Indenture made, &c. between Andrew Atkins, of ————, eſq. of the one part, and Bartholomew Bell, of ————, yeoman, of other part, witneſſeth, that the ſaid Andrew Atkins, for and in conſideration of the rents, duties, ſervices, covenants, and agreements hereinafter reſerved and contained on the part of the ſaid Bartholomew Bell, to be paid, done, obſerved and performed, HATH demiſed, leaſed, ſet, and to farm let, and by theſe preſents DOTH demiſe, leaſe, ſet, and to farm let, unto the ſaid Bartholomew Bell, all that meſſuage, tenement, and farm, commonly called or known by the name of ————, ſituate, lying, and being in the pariſh of ———— [or the ſeveral pariſhes of ————], in the county of ————, and within and parcel of the manor of ————, in the ſaid county of ————, and lately in the tenure of ————, and now or late of the ſaid ————, together with all and ſingular the rights, members, privileges, and appurtenances to the ſaid premiſes or any part thereof belonging or appertaining (excepting and always reſerved out of this preſent demiſe unto the ſaid Andrew Atkins, his heirs and aſſigns, all woods, underwoods, timber, and other trees and ſaplings of what kind or nature ſoever, now growing or being, or which hereafter ſhall grow or be in or upon the ſaid demiſed premiſes or any part thereof; and all mines, veins and beds of coal, lead, copper, and other metals or minerals, and all quarries of lime or other ſtone, now being or which ſhall hereafter be found or diſcovered in or upon the ſaid demiſed premiſes or any part thereof, with full liberty and power to and for the ſaid Andrew Atkins, his heirs and aſſigns, and his and their agents, ſervants, workmen, chapmen, and dealers, and every other perſon that ſhall be authoriſed for that purpoſe, at any time or times hereafter, to enter into or upon the ſaid demiſed premiſes or any part thereof, and there to fell, cut down, work up, cord, ſtack, burn, coal, or otherwiſe convert, the ſaid wood andunderwood, trees and ſaplings, or any part thereof, and alſo to dig, delve, ſearch for, get up, dreſs, and make merchantable and fit for ſale, the ſaid coal, ſtones, metals, and minerals, or any part thereof; and the ſaid excepted premiſes, or any part thereof, to take and carry away with all or any ſort or manner of carriages, and for the ſeveral and reſpective purpoſes aforeſaid, to make and erect all or any kind of warehouſes, engines, machines, ſawpits, coal-hearths, and other conveniences, on the ſaid demiſed premiſes or any part thereof, at his and their free will and pleaſure; and alſo except and reſerved unto the ſaid Andrew Atkins, his heirs, and aſſigns, full liberty and power to and for him and them, and his and their agents, ſervants, and workmen, at any time or times hereafter to dig, raiſe, and carry away, marl, clay, gravel, and ſand, in and from the ſaid demiſed premiſes or any part thereof, for the manuring of other his or their lands, the making of roads, bricks, or tiles, or other purpoſes (in caſe there ſhall be more than ſhall be wanted thereon); and plant any part or parts of the ſaid demiſed premiſes with all or any kind of foreſt-trees, and the ſame from thenceforth to preſerve; and alſo to make any road or roads, piece or pieces of water and water-courſes, and the ſame from time to time to alter and divert, and to take from the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, and convey in exchange for other lands or tene-

ments, or ſell any part or parts of the ſaid premiſes hereby demiſed; and likewiſe to plough and fallow at or after Chriſtmas-day next before the determination of this demiſe, any part or parts of the ſaid demiſed premiſes, and to take and have convenient ſtabling and tyings in the out-buildings on the ſaid demiſed premiſes for the horſes and cattle which ſhall be employed in and about the ſame, making to the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, on the exerciſe of all or any of the liberties and privileges herein before excepted, ſuch ſatisfaction and recompence for the damage he or they ſhall ſuſtain thereby, as two indifferent perſons (whereof the one to be choſen by the ſaid Andrew Atkins, his heirs, or aſſigns, and the other by the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns) ſhall think reaſonable; and likewiſe except and reſerved unto the ſaid Andrew Atkins, his heirs, and aſſigns, full liberty and power to and for him and them, and his or their agents, ſervants, and workmen, to ſow with clover and graſs ſeeds ſuch part and parts of the ſaid demiſed premiſes as ſhall be in tillage the ſpring ſeed-time next before the determination of this demiſe, and upon or after the firſt day of ——— next following ſuch ſeed-time, to take poſſeſſion of the ſame lands, and fence and preſerve the ſame and the clover and graſs therein thenceforth, to and for his and their own uſe and benefit; and alſo upon every fall which ſhall be made on the wood or coppice lands of or on the ſaid demiſed premiſes, to fence and copſe up the ſame, to preſerve the future ſprigs therein from the bite of ſheep and cattle and all other treſpaſs and damage during the ſpace of ——— years, next after each fall reſpectively: and alſo except and reſerved unto the ſaid Andrew Atkins, his heirs, and aſſigns, all game, wild fowl, and fiſh, which now are or hereafter ſhall be in or upon the ſaid demiſed premiſes, or any part thereof, with the ſole liberty, privilege, and power of hunting, courſing, hawking, ſetting, fowling, and fiſhing for the ſame by himſelf or themſelves, and his or their companions, and by his or their gamekeepers, with ſervants, horſes, and dogs, in and upon the ſaid demiſed premiſes, or any part thereof; and the game, fowl, and fiſh there killed or taken, to have and carry away to and for his and their own uſe and benefit, at his and their free will and pleaſure); to have and to hold the ſaid meſſuage, tenement, farm, and other the premiſes (except as herein before excepted), unto the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, in manner following (that is to ſay), the part or parts thereof which is or are meadow land, from the ——— day of ——— laſt paſt, the dwelling-houſe and neceſſary out-buildings, from the ——— day of ——— next coming, and the reſidue of the premiſes from the day of the date hereof, for and during the full and whole end term and time of ——— years thence reſpectively next enſuing, and fully to be complete and ended: and to hold ſuch field, if not leſs than ——— acres, part of the ſaid demiſed premiſes as ſhall be hereafter appointed by the ſaid Andrew Atkins, his heirs or aſſigns, or his or their agent for the time being, as a ——— paſture unto the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, from the end or ſooner determination of the ſaid term therein until the ——— day of ——— then next following: yielding*, paying, rendering, and performing therefore yearly, and in each and every year during the continuance of this demiſe, unto and for the ſaid Andrew Atkins, his heirs and aſſigns, the ſeveral rents, duties, and ſervices hereinafter mentioned, *viz.* the rent or ſum of ——— pounds, of lawful money of

* Several annual rents may, by apt words, be reſerved in the ſame demiſe. 5 *Coke*, 55 *a*.

Great Britain, free and clear of and from all taxes and deductions whatſoever (except land-tax), by two equal half-yearly payments, at or upon every ——— day of ———, and ——— day of ———, in each and every year (the firſt payment to be made on the ——— day of ——— next), and two ſtrikes or buſhels of oats, and one couple of fat fowls, on every ——— day of ———; and alſo two days' work or labour with a waggon and four horſes, attended by or with a waggoner at ſuch time or times in the year as ſhall from time to time be appointed; and likewiſe the keep of a dog and a cock, if required; and grinding all the corn and grain which ſhall be eat or conſumed in or upon the ſaid demiſed premiſes or any part thereof, during the continuance of this demiſe, at the mill of the ſaid Andrew Atkins, his heirs or aſſigns, called ——— mill, in the pariſh of ——— aforeſaid, he and they being well uſed and in convenient time diſpatched; and doing and performing ſuit and ſervice at all and every the courts to be holden or kept for the manor or borough of ——— aforeſaid, and abiding by and obeying all and every the orders and by-laws which ſhall be there made and ordained; and alſo yielding and paying for every acre of meadow or uſual mowing ground of the ſaid demiſed premiſes, which he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall plough or break up for tillage, and for every of the premiſes hereby demiſed exceeding ——— acres, which he or they ſhall have in tillage in any one year of this demiſe, and alſo for every acre thereof exceeding ——— acres, which he or they ſhall mow in any one of the laſt four years of this demiſe; and likewiſe for every acre thereof exceeding ——— acres, which he or they ſhall ſow with flax or hemp ſeed, and for each and every of them, ſeverally and reſpectively, the rent or ſum of ——— pounds, of like lawful money, over and above the ſaid rents, duties, and ſervices herein before reſerved, and in that proportion for more or leſs than an acre at or upon every ſaid ——— day of ———, and ——— day of ———, the firſt payment thereof reſpectively to be made on ſuch of the ſaid days as ſhall firſt happen after the committing or doing of the acts or deeds for which the ſame is or are hereby reſpectively reſerved as aforeſaid, and to continue payable and be paid thenceforth during the continuance of this demiſe. And likewiſe yielding unto the ſaid Andrew Atkins, his heirs, and aſſigns, for every timber or other tree or ſapling which he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall cut down, top, or lop, without the licence of the ſaid Andrew Atkins, his heirs or aſſigns, or his or their agent for the time being, the ſum of ——— pounds, of like lawful money; AND the ſaid Bartholomew Bell, for himſelf, his heirs, executors, adminiſtrators, and aſſigns, doth hereby covenant, promiſe, and agree, to and with the ſaid Andrew Atkins, his heirs and aſſigns, in manner and form following, (that is to ſay) that he ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, ſhall and will well and truly pay *, render, and perform, or cauſe to be paid, rendered, and performed, unto and for the ſaid Andrew Atkins, his heirs and aſſigns, the aforeſaid yearly rents of —— pounds, two ſtrikes or buſhels of oats, one couple of fowls, two days' labour with a waggon, a waggoner, and

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* Where the leſſee covenants generally to pay rent, though he has had no enjoyment of the premiſes, *as where they are burned down*, and there is a covenant to repair in all caſes except that of fire, yet ſhall the tenant be liable for all growing arrears of rent under this covenant. 1 *Term Reports*, 310.

four horſes, and the keep of a dog and a cock, and alſo the ſaid ſeveral other yearly and other rents or ſums of money herein before reſerved (if the ſame ſhall reſpectively become payable), on the days and in the proportions herein before limited and appointed for payment thereof reſpectively; and ſhall and will pay, bear, and diſcharge, all taxes, rents, aſſeſſments, and impoſitions whatſoever (except the land-tax*), which ſhall be charged on, or become payable for or in reſpect of the ſaid demiſed premiſes, or any part or parcel thereof, from time to time, or at any time or times during the continuance of this demiſe: and alſo ſhall and will, at his and their own proper coſts and charges, well and ſufficiently repair†, ſcour, cleanſe, amend, maintain, keep, and preſerve the ſaid meſſuage, tenement, and other the premiſes hereby demiſed, and all the houſes, edifices, walls, buildings, hedges, ditches, mounds, gates, bars, ſtiles, pales, rails, fences, ſoughs, drains, gutters, and water-courſes, which now is or are, or at any time during the continuance of this demiſe, ſhall be in or upon the ſaid demiſed premiſes, or any part thereof, in, by, and with all needful and neceſſary repairs, ſcourings, cleanſings, and amendments whatſoever, where, when, and as often as need ſhall be or occaſion require (accidents by fire only excepted): and at the end or other ſooner determination of this demiſe, all and ſingular the ſame premiſes and every part and parcel thereof ſo reſpectively well and ſufficiently repaired, cleanſed, amended, kept, and preſerved, ſhall and will leave and yield up, unto the ſaid Andrew Atkins, his heirs, or aſſigns, he the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, having for and towards the doing ſuch repairs, neceſſary and convenient rough timber on the ſtem on the ſaid demiſed premiſes, or within two miles thereof, by the appointment of the ſaid Andrew Atkins, his heirs, or aſſigns, or his or their agent for the time being, and not otherwiſe: AND FURTHER, that the ſaid Andrew Atkins, his heirs, or aſſigns, and his or their agent for the time being, with artificers and workmen, ſhall and may, in the day time, at any time or times during this demiſe, enter into and upon the ſaid demiſed premiſes or any part thereof, and view, ſearch, examine into, and ſee the ſtate and condition of the ſame ‡, and

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* The leſſee has a right in all caſes to ſtop the land-tax out of the rent to his landlord, unleſs there is an expreſs agreement that he ſhall not. *Sayer's Reports*, 78.

And an exception as to the land-tax, only extends to that ſum which was payable at the time of the execution of the leaſe; and if the tenant by improvements, ſuch as new buildings or the like, occaſions an increaſe in the future aſſeſſments, the landlord is not liable to deduct out of his rent more than the amount of the original charge at the time the leaſe was granted. 3 *Term Reports*, 377.

† Under this covenant *the ordinary and natural decay* is no breach thereof. *Fitzherbert's Abr. Tit. Cov. f.* 4.

And if the leſſee *pulls down houſes or ſuffers them to decay*, no action will lie againſt him till the end of the term; for before that time he may repair them. *Fitzherbert, N. B.* 342.

But if he cuts down timber or trees, covenant lies immediately; for ſuch cannot be replaced in the ſame plight at the end of the term. *Ibid.*

‡ A leſſor may enter upon the premiſes of his leſſee to ſee the ſtate of the repairs, though there

leave notice in writing thereon of such defects or want of reparation, scouring, cleansing, or amendment, as shall be then and there found: and in case the said Bartholomew Bell, his executors, administrators, or assigns, shall not well and sufficiently repair and amend the same within three calendar months next after such notice, that then he the said Andrew Atkins, his heirs, or assigns, or his or their agent for the time being, with artificers and workmen, shall and may enter into and upon the said demised premises, and do, rectify, and complete such reparations and defects, and charge the costs and expences thereof unto and upon the said Bartholomew Bell, his executors, administrators, and assigns, as an additional rent for the said demised premises for the year in which he or they shall neglect to do such repairs, and upon non-payment thereof, he the said Andrew Atkins, his heirs, or assigns, or his or their agent for the time being, shall and may levy and recover the same by distress and sale of the goods and chattels to be found on the said demised premises or any part thereof, in such ample manner and form, and as fully and effectually as he or they may levy the said original or proper rent hereby reserved, or either of them, in case the same shall be in arrear; AND LIKEWISE, that he the said Bartholomew Bell, his executors, administrators, and assigns, from time to time, and at all times during the continuance of this demise, shall and will plant quick in the dead or decayed part of the hedges of the said demised premises, and use his and their best endeavours to preserve and keep from bite of cattle, and other destruction, spoil, and damage, as well the said quick, as all and every the woods, underwood, timber, and other trees and saplings, which now are or hereafter shall be planted or growing on the said demised premises, or any part thereof; and shall not nor will cut or break down, root up, top, lop, or injure any or either of them, except taking timber for repairs, by appointment as aforesaid, and also taking, by like appointment (and not otherwise) from such of the said trees as are pollards, reasonable wood for summer fuel in the dairy only, and for ploughbote, cartbote, and hedgebote, off and on the said demised premises; and shall and will constantly inhabit, or cause to be inhabited by a fit and proper family, the dwelling-house, and occupy, manage, manure, and improve, in a good, proper, and husbandlike manner, the lands and premises hereby demised, and not burn, bat, run out, or otherwise beggar or impoverish, nor commit or suffer any waste, spoil, or destruction on the same, or any part thereof *: and also shall and will thresh and clean on the said demised premises, all the corn and grain which shall be grown thereon, and eat and consume thereon all the hay, straw, fodder, and fuel, which shall be produced on the same or any part thereof; and likewise shall and will yearly, and every year, during the

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be no covenant for that purpose, such liberty being allowed by law for the general benefit of the lessor's estate. *Coke Lit.* 54.

* Although a tenant does not hold under any lease, the mere relation of landlord and tenant will raise an implied promise on the part of the tenant to cultivate the land in a good and husbandlike manner. 5 *Term Reports*, 373.

And under a general covenant to use the premises during the term in *a careful, proper, and husbandlike manner*, the tenant must expend all the manure made upon the land, upon the demised premises; but is not obliged to bring back manure produced by straw and the like, carried away at the end of his term. *Reports*, 279.

continuance of this demiſe, at ſeaſonable times, and in an huſbandlike manner, ſpend, uſe, ſpread and beſtow, in and upon fit and proper parts of the ſaid demiſed premiſes, four waggon-loads of good ſtone lime, and all the muck, dung, compoſt, and manure which ſhall be made, produced, or raiſed on the ſaid demiſed premiſes, or any part thereof; and ſhall not nor will break up or ſow with corn or grain, any more or other part or parts of the lands hereby demiſed, than he or they ſhall at any time well and ſufficiently manure, nor take more than three crops therefrom under any one tillage, for one of which crops he or they ſhall and will make a ſummer fallow, or have a fallow ſown with turnips on the ſame ground, or break up a clover-lay of the firſt or ſecond year's growth, and well manure the ſame, and with the laſt of ſuch crops lay down the land ſo tilled therewith, well ſown with a proper quantity of good clover and rye-graſs ſeeds; and ſhall and will at the end, or other ſooner determination of this demiſe, leave on the ſaid demiſed premiſes, to and for the uſe and benefit of the ſaid Andrew Atkins, his heirs or aſſigns, one half part of all corn and grain whereof the ſeed ſhall have been tilled or ſown thereon at the then laſt ſeedneſs * in any bruſh or ſtubble, and one-third part of all corn and grain whereof the ſeed ſhall have been ſown thereon, at the then laſt ſeedneſs, in a fallow or a clover-lay of the firſt or ſecond year's growth, well manured; and alſo all the muck, dung, compoſt, and manure which ſhall be made, produced, or raiſed on the ſaid demiſed premiſes, or any part thereof, during the then laſt twelve months, without having or claiming any allowance or ſatisfaction for the ſame. And alſo ſhall and will permit and ſuffer the ſaid Andrew Atkins, his heirs and aſſigns, to have, exerciſe, and enjoy all and every the liberties, privileges, matters and things herein before excepted out of this demiſe, without any let or moleſtation, and ſhall not nor will aſſign, ſet or let, or yield and deliver up the poſſeſſion of the ſaid demiſed premiſes, or any part thereof, to any perſon or perſons whomſoever without the licence of the ſaid Andrew Atkins, or his heirs or aſſigns, firſt had and obtained in writing, and that only for ſuch time, to ſuch perſon or perſons, and in ſuch manner and form as ſhall in ſuch licence be expreſſed †; nor ſhall nor will permit or ſuffer any perſon

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* As to way-going crops, ſee the chapter which treats on "*Wrongs in reſpect to the rights of tenants.*"

† A covenant not to *aſſign, tranſfer, ſet over, or otherwiſe do or put away the leaſe or premiſes*, does not extend to an underleaſe granted for part of the term. 2 *Blackſ.* 766; 3 *Wilſon*, 234.

But if a leaſe contain a proviſo, that the leſſee, and his adminiſtrators, ſhall not *ſet, let, or aſſign over*, the adminiſtratrix of the leſſee, cannot underlet without incurring a forfeiture. 3 *Ter. Rep.* 425.

Yet if the leſſee by will deviſes the term without the leſſor's conſent, this will not be a breach of the covenant. *Style*, 483.

And it ſeems that any aſſignment by act of law is not a breach of this covenant; as if the leſſee become a bankrupt, an aſſignment by the aſſignees under his commiſſion is not a breach of covenant. 3 *Wilſon*, 236.

or perſons to make or uſe any road or path, other than thoſe which are or ſhall be lawfully eſtabliſhed; or to hunt, courſe, hawk, ſet, fowl, or fiſh in upon or over the ſaid demiſed premiſes, or any part thereof; but ſhall and will, when and as often as required by the ſaid Andrew Atkins, his heirs or aſſigns, give notice in writing to all and every perſon and perſons to keep off the ſaid demiſed premiſes, and not thereafter come into or be found upon the ſame, or any part thereof. And againſt ſuch perſon and perſons, or any of them, who ſhall, after ſuch notice, offend therein, to or for the intent or purpoſe of making or uſing a new road or path, or of hunting, courſing, hawking, ſetting, fowling, or fiſhing, ſhall and will at the requeſt, coſts and charges of the ſaid Andrew Atkins, his heirs or aſſigns, commence and proſecute one or more ſuit or ſuits at law for the ſame, and not delay, releaſe, compound, or diſcontinue the ſame, or any of them without the conſent of the ſaid Andrew Atkins, his heirs and aſſigns; and the damages which ſhall be recovered thereby, ſhall and will pay and apply for and towards the coſts, charges, and expenſes of ſuch ſuit or ſuits. And the ſaid Andrew Atkins, for himſelf, his heirs and aſſigns, doth hereby covenant, promiſe, and agree to and with the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, in manner and form following, viz. That he the ſaid Andrew Atkins, his heirs or aſſigns, ſhall and will allow unto the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, out of the yearly rent hereby reſerved, the price at the kiln for four waggon-loads of lime. And alſo ſhall and will, with all convenient ſpeed, put the dwelling-houſe and out-buildings of and on the ſaid demiſed premiſes in good and ſubſtantial order, condition and repair; and likewiſe ſhall and will, from time to time, appoint unto the ſaid Bartholomew Bell, his executors, adminiſtrators and aſſigns, neceſſary and convenient timber on the ſtem on the ſaid demiſed premiſes, or within two miles thereof, for and towards the repairing of the ſame, and alſo reaſonable wood from the pollard trees, or elſewhere on the ſaid demiſed premiſes, for ſummer fuel, for

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So if a leſſee who has covenanted not *to let, ſet, aſſign, transfer, make over, barter, exchange, or otherwiſe part with the indenture, &c.* with a proviſo that the landlord may in ſuch caſe re-enter, gives a warrant of attorney to confeſs judgment in which the leaſe is taken in execution and ſold, it is no forfeiture of the leaſe. 8 *Ter. Rep.* 57.

But if a warrant of attorney be given expreſsly for this purpoſe, it is in fraud of the covenant, and a forfeiture of the leaſe. 8 *Term Reports*, 300.

Alſo covenants may be introduced in a leaſe to prevent the term paſſing under a commiſſion of bankrupt, or being taken on an execution againſt the tenant; and ſuch covenants are now become very uſual. 2 *Term Reports*, 133; 8 *Term Reports*, 57, 3.

It is alſo to be obſerved that if a forfeiture has been incurred by aſſignment, and if the leſſor accepts rent afterwards, this is a waiver of the forfeiture; but in ſuch caſe it muſt appear that at the time he accepted the rent, he knew of the forfeiture incurred. 2 *Ter. Rep.* 430.

Alſo after a licence to let or aſſign has been once obtained, either in reſpect of the whole, or *only a part* of the premiſes, the aſſignee is no longer bound by the covenant, but may afterwards let or aſſign the whole or any part at pleaſure. 4 *Coke*, 119.

the dairy, and for ploughbote, cartbote, and hedgebote as aforesaid. And that he the said Bartholomew Bell, his executors, administrators and assigns, paying, rendering, and performing the several rents, duties, and services hereby reserved, and observing and performing the covenants and agreements herein contained, shall and may peaceably and quietly have, hold, occupy, and enjoy the said demised premises, and every part thereof, without the lawful let, suit, eviction, molestation, or denial of the said Andrew Atkins, his heirs or assigns, or of any person or persons, lawfully or equitably claiming, or to claim by, under, or in trust for him, them, or any of them. PROVIDED ALWAYS, and it is hereby agreed, by and between the parties hereto; and these presents are, upon this express condition, that if all, any, or either of the said yearly or other rents, duties, or services hereby reserved, shall be behind or unpaid, or unperformed wholly or in part by the space of twenty days, next after either of the said days or times, whereon the same ought respectively to be paid or performed; and the same shall be demanded on the expiration of the said twenty days, or at any time afterwards, and not then paid. Or if the said Bartholomew Bell, his executors, administrators or assigns, shall not keep all and singular the said demised premises, in all things in such good and sufficient order, condition, and repair as aforesaid, or shall not pay on demand such sum and sums of money as the said Andrew Atkins, his heirs or assigns, shall lay out and expend in repairing or amending the same as aforesaid, or shall not plant quick from time to time in the dead or decayed parts of the hedges, and preserve and keep from destruction, spoil and damage, the same and the wood, underwood timber, and other trees and saplings, which now are, or hereafter shall be planted or growing on the said demised premises as aforesaid; or if he or they shall not inhabit, or cause to be inhabited as aforesaid, the said dwelling-house, and occupy, manage, manure, and improve the lands and premises, hereby demised in the manner hereinbefore agreed upon, expressed, and laid down, or shall carry off the said demised premises any unthrashed corn or grain, or any hay, straw, fodder, fuel, muck, dung, compost, or other manure, which shall be produced or raised thereon, or let or molest the said Andrew Atkins, his heirs or assigns, or his or their agents, servants, workmen, chapmen, and dealers, or any of them, in the exercise or enjoyment of all or any of the liberties, privileges, matters or things herein before excepted; or shall assign, set, or let the said demised premises, or any part thereof, without such licence as aforesaid, or otherwise than as in such licence shall be expressed, or shall permit or suffer any person or persons to make any road or path, (other than those which are or shall be lawfully established) or to hunt, course, hawk, set, fowl, or fish in, upon, or over the said demised premises, or any part thereof, or shall refuse or neglect to give such notice or notices, or to commence, prosecute, and continue such action or actions at law as aforesaid, at the request, costs, and charges of the said Andrew Atkins, his heirs or assigns, or to pay and apply the damages which shall be recovered thereby for and towards such costs and charges as aforesaid. THAT THEN and from thenceforth, for all or any of the said causes, it shall and may be lawful to and for the said Andrew Atkins, his heirs or assigns, into all and singular the said demised premises, or into any part or parcel thereof, in the name of the whole to re-enter, and the same to have again, re-possess, and enjoy as in his and their first and former estate, any thing herein before contained to the contrary thereof in anywise notwithstanding. In witness, &c.

Form of a Lease for a long Term of Years from the Lord of a Manor, determinable on the Death of the Lessee.

THIS Indenture made the —— day of ———, in the —— year of the reign of our sovereign lord George the third, by the grace of God of the united kingdom of Great Britain and Ireland, king, defender of the faith and so forth; and in the year of our Lord ——, Between Andrew Atkins, of ————, of the one part, and Bartholomew Bell, of ————, of the other part, WITNESSETH THAT the said Andrew Atkins, as well for and in consideration of the sum of £.———— of lawful money of Great Britain, to him in hand well and truly paid by the said Bartholomew Bell, at or before the sealing and delivery of these presents, as and for a fine (the receipt whereof he the said Andrew Atkins doth hereby acknowledge, and thereof and therefrom acquit, release, and discharge the said Bartholomew Bell, his executors and administrators for ever by these presents) as in consideration of the rents, heriots, reservations, covenants, and conditions, herein after reserved, mentioned, and contained, and on the part of the said Bartholomew Bell, his executors, administrators, and assigns, to be paid, rendered, observed, done, and performed, HATH demised, granted, and to farm let and set, and by these presents doth demise, grant, and to farm let and set unto the said Bartholomew Bell, ALL that messuage and tenement called ————, with sixty acres of land thereunto belonging, be the same more or less, situate, lying, and being in ————, within the parish and manor of ————, now in the possession of him the said Bartholomew Bell, or his under-tenants; and all ways, paths, passages, waters, water-courses, easements, profits, commodities, advantages, and appurtenances whatsoever to the said premises hereby demised, belonging or in any wise appertaining, EXCEPT out of this present demise and grant, and always reserved unto the said Andrew Atkins, his heirs and assigns, all and all manner of timber and other trees of what nature or kind soever, and young saplings likely to become timber, pollard and other trees, now standing, growing, or being, or which at any time hereafter shall or may stand, grow, or be in or upon the said demised premises, or any part thereof, with free liberty and full power for the said Andrew Atkins, his heirs and assigns, and all other persons, to be by him or them authorised and empowered to fell, cut down, stub, root, work up, cart, and carry the same away with men and with horses, carts, and carriages, and to sell and dispose of the same at all times and seasons. AND ALSO, except out of this present grant and demise, and always reserved unto the said Andrew Atkins, his heirs and assigns, all coals, seams of coals, mines, minerals, and quarries of stone, beds of sand, gravel, marl, or clay, of what nature or kind soever, which now are, or at any time, and from time to time hereafter, shall or may be found in or upon the said hereby demised premises or any part thereof, with free liberty of ingress, egress, and regress, to and for the said Andrew Atkins, his heirs and assigns, and his and their agents, servants, and workmen, and all others, to be by him or them the said Andrew Atkins, his heirs or assigns authorised to come into and upon the said hereby demised pre-

miſes, and every or any part thereof, to work and dig for the ſaid coals, mines, minerals, and quarries of ſtone, beds of ſand, gravel, marl, or clay, and to ſell and diſpoſe of whatever may be there found at his and their reſpective wills and pleaſures. AND ALSO to erect fire-engines, and to make waggon-ways, and to uſe all other inventions of what nature or kind ſoever, for the winning, working, leading, carrying away, ſelling and diſpoſing of the ſame. And alſo, except out of this preſent grant and demiſe, and always reſerved unto the ſaid Andrew Atkins, his heirs and aſſigns, all liberties of hawking, hunting, fiſhing, fowling, and ſhooting, and alſo all fiſh, wild-fowl, hares, partridges, pheaſants, and other game, waifs, eſtrays, goods and chattels of felons and fugitives, and felons of themſelves, deodands, treaſure-trove, and all other royalties, caſual profits and franchiſes whatſoever, at any time or times happening or being, or to be uſed or exerciſed upon the ſame premiſes, TO HAVE AND TO HOLD the ſaid meſſuage or tenement, and all and ſingular other the premiſes hereby demiſed and granted, or intended ſo to be with the appurtenances, (except as before is excepted) unto the ſaid Bartholomew Bell, his executors, adminiſtrators and aſſigns, immediately from the —— day of ———, now laſt paſt, for and during the full end and term of ninety-nine years, if he the ſaid Bartholomew Bell ſhall ſo long live, yielding and paying therefore, yearly and every year, for and during the continuance of the ſaid term, unto the ſaid Andrew Atkins, his heirs and aſſigns, the rent or ſum of £.———— of lawful money of Great Britain, at two half-yearly payments, (that is to ſay,) on the feaſts of the Annunciation of the Bleſſed Virgin Mary, and Saint Michael the Archangel, by even and equal portions in every year, the firſt payment thereof to be made on the feaſt day of the Annunciation of the Bleſſed Virgin Mary, now next enſuing, and alſo YIELDING AND PAYING unto the ſaid Andrew Atkins, his heirs and aſſigns, immediately and after the death and every aſſignment, ſurrender and forfeiture of the ſaid Bartholomew Bell, and ſo likewiſe of all and every other perſons for the time being, who ſhall be tenant or tenants of the ſaid premiſes, or any part thereof, by virtue of theſe preſents, the ſum of £.———, for and in the name of an heriot or farlieu; and alſo YIELDING AND PAYING, yearly and every year, during the ſaid term, hereby granted unto the ſaid Andrew Atkins, his heirs and aſſigns, the ſum of £.————, of like money for every acre of meadow or paſture land, part of the premiſes that has not been tilled, ploughed or broken up, within the ſpace of —— years before the day of the date of theſe preſents, which the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall plough, break up, or convert into tillage, or cauſe or ſuffer to be ploughed, broken up, or converted into tillage, and ſo in proportion for any greater or leſs quantity of land than an acre*, the ſaid laſt-mentioned rent to be paid on the feaſt of St.

* It was formerly, and is indeed, by ſome, ſtill the practice to ſecure againſt the converſion of meadow and paſture into arable land, by the reſervation of a ſum in the nature of a penalty; but there is a diſtinction to be obſerved whether the penalty is in the nature of a puniſhment for default, or whether it is a part of the agreement: thus if there be a covenant not to plough up meadow or paſture land under a penalty of £.—— per acre per annum, or the like, there the penalty

Michael the archangel, in every year, without making any deduction or abatement thereout for taxes or on any other account whatsoever, the first payment thereof to be made on the feast of St. Michael the archangel, which shall first happen next after the ploughing or breaking up of the same. AND the said Bartholomew Bell, for himself, his heirs, executors, administrators and assigns, doth hereby covenant, promise, and agree to and with the said Andrew Atkins, his heirs and assigns, that he the said Bartholomew Bell, his executors, administrators and assigns, shall and will well and truly pay, or cause to be paid, unto the said Andrew Atkins, his heirs and assigns, the said yearly rents and heriots, at the days and times, and in manner and form as the same are above reserved and made payable. AND ALSO that he the said Bartholomew Bell, his executors, administrators and assigns, shall and will do his and their suit, service and attendance, at all and every the courts of the said Andrew Atkins, his heirs and assigns, to be holden and kept in and for the manor of ———— aforesaid, upon such reasonable notice and warning thereof as shall be given to the other tenants of the said manor, and pay and discharge all such fines, pains, and amerciaments, as shall be set, taxed, and imposed upon him and them, as the same shall grow due and be required from time to time, during the continuance of the said term; and shall and will, at their own proper costs and charges, when and as often as occasion shall require, well and sufficiently repair, sustain, uphold, maintain and amend the same demised premises, and every part thereof, as well in houses, walls, coverings, timber, floorings, gates, posts, bars, stiles, hedges, ditches and fences, as in all other needful and necessary reparations and amendments whatsoever, during the continuance of the said term. AND at the end or other sooner determination of the same term, the said premises in good and sufficient tenantable repair, shall and will peaceably and quietly leave and yield up unto the said Andrew Atkins, his heirs and assigns, without doing or suffering to be done thereon any waste, spoil, or destruction. AND ALSO shall and will yearly, on some part of the said demised premises most convenient for the purpose, to be appointed by the said Andrew Atkins, his heirs or assigns, or his or their steward or stewards, for the time being, plant and preserve to grow unto timber, three trees at least, of oak, ash, or elm, or otherwise forfeit and pay unto the said Andrew Atkins, his heirs and assigns, the sum of ———— as a penalty for every tree not planted and preserved according to the true intent and meaning of this present covenant. AND ALSO shall and will, from time to time, and at

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is by way of punishment, and may be relieved against in a court of equity, namely, in the Court of Chancery or Exchequer. *But if the covenant* (and the words yielding and paying operate as such) be to *pay £ —— per ann. for every acre of meadow ploughed up; this is a part of the agreement between the lessor and lessee, and must be paid.* 4 *Burrow's Reports*, 2228.

It is therefore the most advisable mode of protecting the lessor against the devastation of meadow and pasture land, to adopt the above form of a reservation of increased rent for every acre broken up or converted into arable ground; as the sum stipulated to be paid in such case may have the effect of a total prohibition.

all times during the continuance of this preſent demiſe, permit and ſuffer his and their name or names to be made uſe of by the ſaid Andrew Atkins, his heirs and aſſigns, and his and their ſteward and ſtewards for the time being, in diſcharging or giving notice to any perſon or perſons not to come upon the ſaid demiſed premiſes, or any part thereof, to ſeek for, hawk, hunt, courſe, chaſe, diſturb, ſhoot, take, kill, or deſtroy, any game, fiſh, or wild-fowl, or to commit any other treſpaſs, damage, or injury there or thereupon; and in commencing and proſecuting, and carrying on any action, ſuit, or proſecution againſt any perſon or perſons, for any ſuch treſpaſs, damage, or injury, and ſhall not nor will diſavow or become nonſuit in any ſuch action, ſuit, or proſecution, or otherwiſe releaſe and diſcharge the ſame. He the ſaid Bartholomew Bell, his executors, adminiſtrators and aſſigns, being indemnified by the ſaid Andrew Atkins, his heirs or aſſigns, from all coſts, charges, and expenſes that ſhall or may be occaſioned thereby in anywiſe. And alſo ſhall and will grind, or cauſe to be ground, all griſt, corn, and grain, that ſhall happen to be uſed and ſpent upon the ſaid demiſed premiſes, at the Lord's cuſtomary mill, in ———— as aforeſaid, or in default thereof ſhall and will render and pay unto the ſaid Andrew Atkins, his heirs and aſſigns, for every buſhel of ſuch griſt or corn that ſhall not be ground at the ſaid mill *. Provided always, that if the ſaid yearly rents, or any or either of them, or any part or parts of them, any or either of them reſpectively, or the ſaid heriot or farlieu hereby reſerved and made payable, or any or either of them, or any part of them, any or either of them ſhall be behind, unyielded or unpaid by the ſpace of thirty days next after the ſame ſhall become due and payable, according to the reſervations aforeſaid, and no ſufficient diſtreſs or diſtreſſes ſhall be found in or upon any part of the ſaid demiſed premiſes for levying, and ſufficient to anſwer the ſame, with the arrears thereof, if any, and all coſts and charges to be occaſioned by the non-payment, or by the not rendering of the ſame. Or if the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall give, grant, or aſſign the ſaid demiſed premiſes, or any part thereof, to any perſon or perſons whomſoever, (other than and except to his or their lawful child or children, and that for the whole of the ſaid premiſes hereby granted) for all or any part of the term hereby granted therein, or for any term or eſtate by way of underleaſe exceeding one year, without the licence of the ſaid Andrew Atkins, his heirs or aſſigns, in writing, under his or their hand or hands firſt had and obtained †; or if the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall give, grant, or aſſign only part of the ſaid premiſes, or ſhall

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* If a man is entitled by preſcription to have all the corn of the tenants of a certain manor ground at his mill, an action on the caſe lies againſt any of the tenants who carry their corn to be ground elſewhere. 2 *Saunders*, 115.

But if a man ſet up a new mill in the neighbourhood of an antient one, an action will not lie though a damage may from thence accrue to the old mill, for ſuch rivalſhip is of public benefit and advantage, and the owner's remedy is as above ſtated againſt the cuſtomary tenants only who may grind there. 1 *Rolle Abr.* 107.

† See page 806 ſupra as to the power of copyholders to grant leaſes.

give, grant, or aſſign the whole of the ſaid premiſes to his or their lawful child or children, and ſuch child or children ſhall give, grant, or aſſign the ſame premiſes, or any part thereof, to any perſon or perſons whomſoever without the like licence; or if the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall do or commit, or ſuffer to be done or committed in or upon the ſaid demiſed premiſes, or any part thereof, any manner of waſte* to the value of £. ———— or above, and ſhall ſuffer the ſame to become ruinous and in decay, to the like value, or above, or ſhall not, in a ſubſtantial manner, repair the ſame when and as often as occaſion ſhall require, then and from thenceforth, for all or any of the cauſes aforeſaid, it ſhall and may be lawful to and for the ſaid Andrew Atkins, his heirs and aſſigns, into and upon the ſaid demiſed premiſes, or any part thereof in the name of the whole, to reenter, and the ſame to have, again repoſſeſs and enjoy, as in his and their former eſtate and right, this Indenture, or any thing herein contained to the contrary thereof in anywiſe notwithſtanding. AND the ſaid Andrew Atkins, for himſelf, his heirs and aſſigns, doth covenant, promiſe, and agree to and with the ſaid Bartholomew Bell, his executors, adminiſtrators and aſſigns, by theſe preſents, that he the ſaid Bartholomew Bell, his executors, adminiſtrators, and aſſigns, (duly paying the rents above reſerved, and yielding ſuch heriot or farlieu as aforeſaid, or paying ſuch ſum of money in lieu thereof at the election of the ſaid Andrew Atkins, his heirs or aſſigns, and obſerving and performing the clauſes, exceptions, conditions, proviſos, covenants and agreements herein before made and contained, and which, on the part and behalf of the leſſee, his executors and adminiſtrators, are or ought to be paid, obſerved, performed, fulfilled and kept), ſhall and lawfully may peaceably and quietly have, hold, occupy, poſſeſs and enjoy, the ſaid hereby demiſed premiſes, with the appurtenances, (except as before-mentioned) from henceforth for and during the continuance of the ſaid term hereby granted and demiſed, without the let, ſuit, trouble, eviction, diſturbance, claim or demand of him the ſaid Andrew Atkins, his heirs or aſſigns, or any other perſon or perſons lawfully or equitably claiming or to claim, from, by, through, or under him, them, or any of them; PROVIDED NEVERTHELESS, and it is hereby agreed, by and between the ſaid parties hereto, that when and as often as any queſtion ſhall ariſe in any court of juſtice, whether the perſon or perſons on whoſe death or deaths the term hereby granted is made determinable be living or dead, it ſhall be incumbent on the perſon or perſons then intereſted in, or holding or enjoying, or claiming to hold and enjoy the ſaid premiſes, by virtue of, or under this preſent demiſe, to prove ſuch perſon or perſons to be living, to the ſatisfaction of the ſaid Andrew Atkins, his heirs or aſſigns; and that in default of ſuch proof, ſuch perſon or perſons ſhall be deemed and taken to be dead; theſe preſents, or any law, uſage or cuſtom to the contrary in anywiſe notwithſtanding. In witneſs, &c.

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* As the queſtion of waſte is of ſome importance, the reader is referred for information on that head to the chapter which treats diſtinctly upon "*Wrongs in reſpect to the Rights of Landlords.*"

Form of a Lease of Lands in Devonshire for a Term of Twenty-one Years, determinable at the End of the first Seven or Fourteen Years, on a Notice from either of the Parties.

THIS Indenture made, &c. Between Andrew Atkins, of ————————, of the one part, and Bartholomew Bell, ————————, of ————————, of the other part, WITNESSETH, that the said Andrew Atkins, ——— in consideration of the yearly rent hereinafter reserved, and of the covenants, considerations and agreements hereinafter mentioned, expressed and contained, and which on the part and behalf of the said Bartholomew Bell, his executors, administrators, and assigns, are to be kept, done, and performed, HATH demised, leased, set, and to farm let, and by these presents DOTH demise, lease, set, and to farm let, unto the said Bartholomew Bell, ALL that messuage and tenement, with the appurtenances, commonly called or known by the name of ————, situate in ———— aforesaid, now in the possession of the said Bartholomew Bell, his under-tenant or under-tenants, containing by estimation one hundred acres, (be the same more or less) together with all ways, paths, passages, waters, water-courses, profits and advantages whatsoever to the said premises, or any part thereof, belonging or in anywise appertaining, (EXCEPTING and always reserving out of this present demise unto the said Andrew Atkins, his heirs and assigns, all manner of timber and other trees, and saplings likely to become trees, of what kind soever, now standing growing, or being, or which at any time, and from time to time hereafter, shall or may stand, grow, or be planted in or upon the said premises, or any part thereof, with full and free liberty, licence and authority to fell, cut down, root up, convert, draw, take, and carry away the same, with horses, or any manner of carriages or other conveyances, at all seasonable and convenient times during the term hereinafter mentioned, and to make saw-pits for converting such timber-trees on the premises. AND also the right, interest, and privilege of planting trees of every or any sort, on any part of the said hereby demised premises, in or within three feet of the troughs or ditches of the respective hedges of the same premises. AND also the liberty of ingress, egress, and regress, into, from, and upon the said hereby demised premises, or any part thereof, for any or either of the purposes aforesaid, and also to view and see the defects, repairs, and management of the said hereby demised premises or any part thereof). TO HAVE AND TO HOLD the said messuage and tenement hereby demised, or expressed and intended so to be, with the appurtenances, (except as before excepted) unto the said Bartholomew Bell, his executors, administrators, and assigns, from the —— day of ————, last past, for and during and unto the full end and term of twenty one years from thence next ensuing, fully to be complete and ended, YIELDING AND PAYING therefore, yearly and every year, during the said term, unto the said Andrew Atkins, his heirs and assigns, the rent or sum of £. ———, of lawful money of Great Britain, free and clear of and from all rates, taxes, tythes, charges, impositions and outgoings whatsoever, inclusive of the land-tax*, (except as hereinafter is ex-

* Although the lessee covenant to pay rent without deduction or abatement, yet he may deduct the land-tax out of his rent, unless it be expressly mentioned in the lease as one of the taxes which he is to pay. *Cowper* 278.

cepted) at or upon the four moſt uſual feaſts or days of payment of rent in the year, (that is to ſay) the —— day of ————, the —— day of————, the —— day of ————, and the —— day of ————, by quarterly payments, by even and equal portions, the firſt payment thereof to begin and be made on the —— day of ————, now laſt paſt. And the ſaid Bartholomew Bell doth, by theſe preſents, for himſelf, his heirs, executors, adminiſtrators, and aſſigns, covenant, promiſe and agree to and with the ſaid Andrew Atkins, his heirs and aſſigns, in manner following, (that is to ſay) That the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall and will well and truly pay or cauſe to be paid, unto the ſaid Andrew Atkins, his heirs and aſſigns during the continuance of the ſaid term of twenty-one years hereby demiſed, the ſaid yearly rent or ſum of £. ————, at or upon the days or times hereinbefore limited and appointed for the payment of the ſame, in manner and form aforeſaid, according to the true intent and meaning of theſe preſents. And alſo that he the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall and will, from time to time, and at all times hereafter during the continuance of the ſaid term, repair and keep in good repair all the thatch, floors, doors, gates, ſtiles, poſts, hedges and fences, belonging to the ſaid demiſed premiſes, and all other repairs whatſoever (except as hereinafter excepted). And alſo from time to time, and at all times during the ſaid term, repair and keep in good repair the cyder-mill parcel of the ſaid hereby demiſed premiſes, and the ſcrew-preſs, and all other utenſils whatſoever thereunto belonging, or therewith uſed, and alſo the glaſs and lead of the windows, and be at the expenſe of felling and converting timber, for the purpoſe of ſuch repairs, after trees fit for that purpoſe ſhall have been aſſigned to him or them by the ſaid Andrew Atkins, his heirs or aſſigns, on the ſaid demiſed premiſes, or any part thereof, or within —— miles of the ſame. And alſo keep the ſeveral orchards, part of the ſaid premiſes, well planted during the continuance of the ſaid term, with good young apple-trees, ſuch as the ſaid Andrew Atkins, his heirs or aſſigns, ſhall approve of, and dreſs the ſame with the uſual quantity of dung or aſhes, he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, having and taking to and for his and their own uſe and benefit the dead and blown down trees in lieu thereof. And alſo that he the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall and will, from time to time, and at all times during the continuance of the ſaid term, pay, bear, and diſcharge all rates, taxes, tythes and charges whatſoever, incluſive of the land tax, which during the continuance of the ſaid term ſhall become due and payable, for or in reſpect of the ſaid hereby demiſed premiſes, and thereof and therefrom ſave harmleſs and keep indemnified the ſaid Andrew Atkins, his heirs, executors, adminiſtrators and aſſigns, and every of them. And alſo that he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall not nor will till or ear or plough or break up to or for tillage, all or any part of the ſaid hereby demiſed premiſes, more than once in any ſeven years, during the continuance of the term hereby granted therein. And that he the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall and will bring into or lay upon every acre of the ſaid hereby demiſed premiſes that ſhall be ploughed up or put to tillage in each ſeven years of the ſaid term, and ſo in proportion for every leſs quantity than an acre, ———— ———— of good well-burnt

lime, or eight ſcore ſeams or horſe-loads of good black dung, and there mix and ſpread the ſame, after the uſual and accuſtomed courſe of huſbandry within the ſaid county of ————. AND that he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall or will, in each courſe of tillage, bring or carry into and upon the ſaid hereby demiſed premiſes, and there ſpend and ſpread abroad, at leaſt ———— of ſuch lime, or ———— ſeams or horſe-loads of ſuch dung in part of the ſaid firſt-mentioned quantities of lime or dung, before the firſt crop of each courſe of tillage ſhall be taken. AND that he the ſaid Bartholomew Bell, his executors, adminiſtrators, or aſſigns, ſhall not will take from off the ſaid hereby demiſed premiſes, or any part thereof, more than three crops of corn or grain, in any ſeven years during the continuance of the ſaid term; AND that ſuch crops ſhall be taken ſeverally in ſucceſſive years, and one after the other, and that one of ſuch crops only, and that not the laſt, ſhall be of wheat, and the other two crops barley or oats, or one crop of the one part, and the other crop of the other part. AND that he the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall not nor will cut or mow for hay the graſs that ſhall ariſe from any graſs ſeeds, which ſhall be ſown by him or them more than once after ſuch ſeeds ſhall have been ſown, and that not for ſeed, and then only in the next proper ſeaſon after ſowing ſuch graſs ſeeds. AND that he the ſaid Bartholomew Bell, his executors or adminiſtrators, ſhall not nor will cut any wood growing or to grow on the hedges around the arable ground of the ſaid hereby demiſed premiſes, at any other time or times but when the fields, fenced by ſuch hedges, ſhall be in tillage for their firſt crop of each courſe of tillage. AND that he the ſaid Bartholomew Bell, his executors or adminiſtrators, ſhall and will, upon or within one calendar month after cutting the wood of any hedge, parcel of the ſaid hereby demiſed premiſes, lay, ſtoop, and plaſh the hedges from which ſuch wood ſhall be cut on both ſides, according to the uſual and accuſtomed rules of good huſbandry, adopted and practiſed within the ſaid county of ————. AND that he the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall not nor will, at any time or times during the continuance of the ſaid term, pare, top, or lop, any tree or trees on the ſaid hereby demiſed premiſes, but ſuch as have been uſually pared, topped or lopped. AND that he the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall not nor will, at any time or times during the continuance of the ſaid term, or after the expiration thereof, remove or carry off, or cauſe, permit, or ſuffer to be removed or carried from off the ſaid hereby demiſed premiſes, any ſtraw, corn in ſtraw, muck, dung, aſhes, ſoil, compoſt or manure, that ſhall ariſe, grow, or be made on the ſaid premiſes, or any part thereof; nor ſhall nor will demiſe, let, ſet, or aſſign the ſaid premiſes, or any part thereof, to any other perſon or perſons whomſoever, without the leave or licence of the ſaid Andrew Atkins, his heirs or aſſigns in writing, under his or their hand or hands firſt had and obtained. AND that he the ſaid Bartholomew Bell, his executors, adminiſtrators and aſſigns, ſhall not nor will do or commit, or ſuffer to be done or committed, on the ſaid hereby demiſed premiſes, any waſte, devaſtation, ſpoil, ill management, or bad huſbandry whatſoever; but that he the ſaid Bartholomew Bell, his executors, adminiſtrators and aſſigns, ſhall and will, from time to time, and at all times during the continuance of the ſaid

term, dreſs, manure, improve and manage, the ſaid hereby demiſed premiſes, and every part thereof, according to their ſeveral qualities, agreeable to the rules of good huſbandry, and according to the cuſtom and uſage of the ſaid county of—, and at the end or other ſooner determination of the ſaid term, leave and yield up the ſaid hereby demiſed premiſes, and every part and parcel thereof, with their appurtenances, ſo repaired and amended, manured, improved, and managed, into the hands of the ſaid Andrew Atkins, his heirs or aſſigns, without any notice for that purpoſe *. And the ſaid Andrew Atkins, for himſelf, his heirs, executors, adminiſtrators and aſſigns, doth, by theſe preſents, covenant and agree with the ſaid Bartholomew Bell, his executors, adminiſtrators and aſſigns, that he the ſaid Andrew Atkins, his heirs or aſſigns, ſhall and will, from time to time, and at all times during the ſaid term, repair and keep in repair the main and principal walls, roofs, and coverings, of all ſuch parts of the dwelling-houſe, barn, cyder-mill-houſe, and other buildings of the ſaid demiſed premiſes as are covered with ſlate. And that he the ſaid Andrew Atkins, his heirs or aſſigns, when thereunto requeſted by the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, and within one calendar month after every ſuch requeſt, ſhall and will aſſign or ſet out to the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſuch tree or trees growing on the ſaid hereby demiſed premiſes, as ſhall or may, in the opinion and judgment of the ſaid Andrew Atkins, his heirs or aſſigns, be fit and proper for the needful and neceſſary repairs of the floors, doors, poſts, ſtiles or gates, of the ſame premiſes, or the cyder-mill, or any of the implements or utenſils therewith uſed. And that it ſhall and may be lawful to and for the ſaid Bartholomew Bell, his executors, adminiſtrators and aſſigns, by and under the due payment of the ſaid rent, and the obſervance and performance of the ſaid covenants and agreements hereinbefore expreſſed and contained, and to be obſerved and kept on his and their parts and behalves, peaceably and quietly to have, hold, uſe, occupy, poſſeſs and enjoy the ſaid

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* If a tenant holds over after the expiration of his term he is a tenant by ſufferance, and will continue liable to rent: and upon the trial of an action for ſuch ſubſequent uſe and occupation of the premiſes, the original rent, unleſs there is a new agreement with the landlord, will be the meaſure of the damages to be given by the jury for ſuch uſe and occupation.

It is however to be obſerved, that where a term is to end on a preciſe day, whether the contract is by deed or writing, or by parol or words only (as in the caſe of a taking for one year certain, and there is no holding over), there is no occaſion for a notice to quit, becauſe both parties are appriſed that, unleſs they come to a freſh agreement, there is an end of the ſubſiſting leaſe or contract between them; and if the landlord gives notice to his tenant to quit at the expiration of the leaſe or term, and the tenant holds over, the landlord is entitled to double rent. 1 *Term Reports*, 53.

For by the ſtatute 4 Geo. II, c. 28, ſ. 1, it is enacted, that if any tenant ſhall wilfully hold over after the determination of the term, *and after demand made in writing for the delivering the poſſeſſion thereof*; ſuch perſon holding over, ſhall pay double the yearly value of the premiſes ſo detained, to be recovered by action of debt, whereunto the defendant ſhall be obliged to give ſpecial bail; againſt which penalty there ſhall be no relief in Equity.

meſſuage and tenement, and all and ſingular other the hereditaments and premiſes, hereby demiſed or expreſſed and intended ſo to be, without any let, ſuit, or interruption of, from or by him the ſaid Andrew Atkins, his heirs or aſſigns, or any other perſon or perſons whomſoever. And if it ſhall happen that the ſaid yearly rent of £. ————, or any part thereof, ſhall be behind and unpaid by the ſpace of twenty days next after either of the ſaid days of payment on which the ſame ought to be paid as aforeſaid, and the ſame ſhall be lawfully demanded on the expiration of the ſaid twenty days, or at any time afterwards, and not paid, and no ſufficient diſtreſs in or upon the ſaid premiſes, or ſome part thereof, by all that time can be found, whereby the ſaid rent ſo being behind, with the arrears thereof (if any), can or may be levied, ſatisfied, and paid; or if the ſaid Bartholomew Bell, his executors, adminiſtrators or aſſigns, ſhall at any time or times during the ſaid term hereby granted, do or commit, or wittingly or willingly ſuffer to be done or committed, any manner of waſte, ſpoil, or deſtruction, in or upon the ſaid premiſes, or any part thereof, to the value of —— or above, in any one year of the ſaid term, and ſhall not ſufficiently repair or amend, or make ſatisfaction for the ſame within three months next after notice or warning thereof in writing ſhall have been given or delivered unto him or them. Then and from thenceforth, for any or either of the cauſes aforeſaid, it ſhall and may be lawful to and for the ſaid Andrew Atkins, his heirs and aſſigns, into and upon all and ſingular the ſaid demiſed premiſes, with their and every of their appurtenances, to re-enter, and the ſame to have again, re-poſſeſs and enjoy, as in his and their firſt and former eſtate, theſe preſents or any thing herein contained to the contrary in anywiſe notwithſtanding. Provided always *, and theſe preſents are upon this condition, nevertheleſs that it ſhall and may be lawful to and for either the ſaid Andrew Atkins, his heirs and aſſigns, or the ſaid Bartholomew Bell, his executors, adminiſtrators and aſſigns, to determine and make void this preſent demiſe, at the expiration of the firſt ſeven or fourteen years of the ſaid term of twenty-one years hereby granted and demiſed, on cauſing notice or warning in writing for that purpoſe to be given or left for the other of them, his or their heirs, executors, adminiſtrators or aſſigns, at his or their then uſual or laſt place of abode, ſix calendar months at leaſt before the day or time hereinbefore limited for determining the ſaid term as aforeſaid, any thing herein contained to the contrary thereof in anywiſe notwithſtanding. And it is hereby agreed, by and between the ſaid parties to theſe preſents, and the ſaid Bartholomew Bell doth hereby promiſe, covenant and grant, that it ſhall or may be lawful to and for the ſaid Andrew Atkins, his heirs and aſſigns, in the proper ſeaſons, for the laſt twelve months, either in the ſeventh, the

* This proviſo creates what is now termed a running leaſe for ſeven, fourteen, or twenty-one years, at the option of the parties. And it has been determined, that ſuch a leaſe gives the leſſee *a preſent intereſt for the firſt of theſe terms only*, with a ſpringing or future intereſt after the expiration of ſuch firſt term, for the next ſubſequent term, if agreeable to the parties; which the law preſumes to be the caſe, unleſs half a year's notice be given previous to the expiration of the term in being. 1 *Term Reports*, 350.

fourteenth, or twenty-firſt year of the ſaid term of twenty-one years, hereby granted as the caſe ſhall require, to make breaches for wheat in or upon any of ſuch acres of the arable ground, part of the ſaid hereby demiſed premiſes, as ſhall be then fallow and out of tillage, and as ſhall not have been ſown with clover and rye or other graſs ſeeds in the preceding year, and break up and prepare the ariſhes, which ſhall be in a courſe of tillage, and ſow ſuch ariſh ground when broken up, and the ground ſo broken up for wheat with ſeeds, and hold the part or parts of the ſaid hereby demiſed premiſes, which ſhall be ſo ſown, from the reſpective times at which the ſame ſhall be ſown, during the then reſidue of the ſaid term. In witneſs, &c.

Form of a Contract used in Dorsetshire and other Counties in the West of England, for letting a Dairy of Cows.*

ARTICLES of agreement made and entered into the 10th day of December, in the forty-third year of the reign of our Sovereign Lord George the Third, by the Grace, &c. and in the year of our Lord 1802, BETWEEN Abel Atkins, of Chilthorne Domer, in the county of

* Not only lands * and houſes may be let for years, but alſo goods and chattels. *Bacon's Abridg. Tit. Leaſes*, (A.)

But the intereſt of the tenant in the latter differs from the intereſt which he hath in lands or the like; for if one let or leaſe for years a ſtock of live cattle, ſuch letting or leaſe is good, and the tenant ſhall have the uſe and profits of them during the term; but yet the owner, or, technically ſpeaking, the leſſor, hath not any reverſion in them, in like manner as in reſpect of land, to grant the ſame over to another, either during the term or after; till the tenant hath re-delivered them to him †; for the leſſor or owner hath only a poſſibility of property in caſe they all outlive the term; for if any of them die during the term, the leſſor or owner cannot have reſtitution, and during the term he hath nothing to do with them; and conſequently of ſuch as die, the property veſts abſolutely in the tenant. *Ibid.*

So whether they live or die, yet all the young ones coming of them as lambs, calves, or the like, belong abſolutely to the tenant, as profits ariſing and ſevered from the principal, ſince otherwiſe the leſſee would pay his rent for nothing.

And therefore this differs from a leaſe of other dead goods and chattels; for there if any thing be added for the repairing, mending, or improving thereof, the owner or leſſor ſhall have the improvements and additions, together with the principal, after the term is ended, becauſe they cannot be ſevered without deſtroying or ſpoiling the principal. *Ibid.*

But the tenant cannot, in ſuch caſe, kill, deſtroy, ſell, or give away the individual cattle demiſed during the term, without being liable to an action. *Ibid.*

* Land is a general and moſt comprehenſive term in itſelf, as it includes not only the ſurface of the earth, but every thing under or over it.

† Therefore, in every ſuch contract there ſhould be a covenant to deliver.

Somerset, yeoman, of the one part, and Brian Bell, of the said place, dairyman, of the other part, as follows; (that is to say),

First, the said Abel Atkins doth hereby agree with the said Brian Bell, that he the said Brian Bell* shall and may, from the 14th day of February next ensuing the day of the date hereof, to the 14th day of February, which will be in the year of our Lord 1804, possess and enjoy the cottage or dwelling-house, called the Dairy-house, near the church, in the parish of Chilthorne Domer aforesaid, and now in the possession of him the said Brian Bell, together with the garden thereunto belonging, and the garden ground in the orchard hereinafter mentioned, called Cothays. Also that he the said Abel Atkins shall and will, from the said 14th day of February next to the said 14th day of February, which will be in the year of our Lord 1804, find, provide, maintain, keep and fodder for and for the use and benefit of the said Brian Bell, forty good cows, fit and proper for a dairy, and permit and suffer the said Brian Bell, during the term last aforesaid, to have and take the milk, produce and increase of the said cows, to and for his own use and benefit. And that in case any of the said cows shall die, or by any accident lose their milk, or become dry and wholly unprofitable during the term last aforesaid, then, and in either of the said cases, the said Abel Atkins shall either provide other cows in full milk, in the place of those dying or losing their milk, or make such abatement and allowance out of the rent hereinafter agreed to be paid as shall be reasonable, and is usual in like cases, not exceeding ——— [*here the allowance should be specifically mentioned*]; which said cows are to have the sole and entire pasturage of all those two closes, called Norkhams, containing, by estimation, twenty-six acres; the close called Angels-ground, containing, by estimation, nine acres and a half; the close called Higher Barns Close, containing, by estimation, six acres; the close called Long-Yard, containing, by estimation, nineteen acres and a half; an orchard called Cothays, containing, by estimation, six acres. A close called Norris's Orchard, containing, by estimation, two acres; and a close called Street-Orchard, containing, by estimation, three acres. All which lands are situate, lying and being in the parish of Chilthorne Domer aforesaid, and are to be hained up for such dairy on the 5th day of April next, and to be stocked therewith on the 13th day of May next, or sooner if the said Brian Bell shall be minded. Also it is agreed, that the said cows shall have the after-grass of the following closes of land (that is to say), all that close called Manmead, containing, by estimation, twenty-two acres and a half; the close called King's-Ground, containing, by estimation, thirteen acres and a half; the close called Dock-Yard and Fisher's Mead, containing, by estimation, twelve acres; and the close called Shortland, containing, by estimation, four acres and a half; a close called Five Acres, containing, by estimation, five acres; and a close called Ten Acres, containing, by estimation, ten acres. Which said last-mentioned lands are also situate in the said parish of Chilthorne Domer. Also it is agreed that the said cows shall have a fortnight's pasturage in a cer-

* A transmissible interest may be given to the dairy-man by adding the usual words, *executors, administrators or assigns.*

tain field called Chilthorne Leaſe, lying in the ſaid pariſh, ſuch fortnight to commence at the time of the ſaid laſt-mentioned field being firſt ſtocked.

Also the ſaid Abel Atkins doth hereby agree that he the ſaid Abel Atkins ſhall and will permit and ſuffer the ſaid Brian Bell to keep and depaſture a horſe, mare, or gelding, on any part of the ſaid premiſes where the ſaid cows ſhall be feeding, at any time during the ſaid term, ending as aforeſaid, on the 14th day of February 1804. And if the ſaid Brian Bell ſhall keep a mare on the ſaid premiſes, and ſhe ſhall have a colt, then the ſaid Abel Atkins ſhall and will permit and ſuffer the ſaid Brian Bell to keep and depaſture ſuch colt with ſuch mare until the 23d day of November next. Also the ſaid Abel Atkins doth hereby agree, that he the ſaid Abel Atkins ſhall and will permit and ſuffer the ſaid Brian Bell to keep pigs in the barton of the farm now in the occupation of the ſaid Abel Atkins, or elſewhere on the ſaid farm, ſuch pigs being properly ringed, and doing no damage to the land, hedges, or apples of the ſaid Abel Atkins. Also the ſaid Abel Atkins doth hereby agree to allow to the ſaid Brian Bell, ſuch fuel for the uſe of the ſaid dairy as he can conveniently ſpare from the ſaid farm, and to carry at his the ſaid Abel Atkins's own expenſe, ſuch coals as the ſaid Brian Bell may want for the uſe of the ſaid dairy, from the Mendip Collieries; he the ſaid Brian Bell paying for ſuch coals, and alſo paying the tolls of the turnpike-gates through which ſuch coals ſhall be brought. Also the ſaid Abel Atkins doth hereby agree to allow the ſaid Brian Bell ſufficient litter for his pigs, cows, and calves, and alſo hay for the ſucking calves, and alſo one hogſhead of cyder for every twenty hogſheads that he the ſaid Abel Atkins ſhall make, from the ſaid 14th day of February next, during the ſaid term on the ſaid farm. Also the ſaid Abel Atkins doth hereby agree to carry at his own expenſe the butter and cheeſe of the ſaid Brian Bell, the produce of ſaid dairy, either to Bridport in the county of Dorſet, or to Honiton in the county of Devon, or to any other place not more diſtant from Chilthorne Domer aforeſaid than Bridport or Honiton aforeſaid, at any time or times, at the requeſt of the ſaid Brian Bell. And the ſaid Abel Atkins doth hereby alſo agree, that in caſe all of the ſaid cows ſhall not have calved by the ſixth day of April next, he the ſaid Abel Atkins ſhall and will allow, out of the rent hereinafter agreed to be paid, at and after the rate of five ſhillings per cow per week, for each cow that ſhall not have ſo calved, until the time that ſuch cow ſhall drop her calf. And the ſaid Brian Bell, in conſideration of the premiſes aforeſaid, doth, on his part and behalf, agree with the ſaid Abel Atkins, that he the ſaid Brian Bell ſhall and will well and truly pay or cauſe to be paid unto the ſaid Abel Atkins, his executors, adminiſtrators or aſſigns, the ſum of four hundred pounds of lawful money of Great Britain, as and for the rent, uſe, and produce of the ſaid forty cows, at the four quarterly payments hereinafter mentioned, that is to ſay, the firſt quarterly payment to be made on the 14th day of February next, for which the ſaid Brian Bell is to be allowed the uſual intereſt; the ſecond quarterly payment on the 13th day of May next, the third quarterly payment on the 13th day of Auguſt next, and the fourth quarterly payment on the 12th day of November next. And alſo that he the ſaid Abel Atkins ſhall and may, at his will and pleaſure, ſtock

with ſheep the ſaid lands, (of which the ſaid Brian Bell is to have the after-graſs) from the 23d day of November next to the end of the ſaid term. ALSO that he the ſaid Brian Bell ſhall not nor will keep the ſaid horſe, mare, or gelding, in the ſtable. WITNESS the hands of the ſaid parties, the day and year firſt written.

The foregoing is taken from a precedent uſed and approved of in Somerſetſhire; but *the following covenant ſeems neceſſary* to be added from the doctrine laid down in *Bacon's* Abridgment title *Leaſes*, (A.) reſpecting contracts for letting of live ſtock.—See the note * in p. 1230. ſupra:

" And further, that he the ſaid Brian Bell, *his executors, adminiſtrators, or aſſigns*, [if the tenant's " intereſt is intended to be tranſmiſſible] ſhall and will, at the end, expiration, or other ſooner " determination of the ſaid term, peaceably and quietly leave, ſurrender and yield up, unto the " ſaid Abel Atkins, his executors, adminiſtrators, or aſſigns, all that the ſaid cottage or dwell- " ing-houſe hereinbefore mentioned, with the garden and garden-ground, land and premiſes " hereinbefore alſo deſcribed;—and alſo all ſuch cows or milch kine as ſhall or may be " then living and depaſturing, or kept and fed in or upon the ſeveral cloſes or parcels of land " hereinbefore mentioned and deſcribed, or any or either of them, for the then uſe and " benefit of the ſaid Brian Bell, by virtue of theſe preſents. In witneſs, &c."

*Form of a Lease for a further Term of Years, before the Expiration of the exiſting Term, by an Indorſement on the original Demiſe or Leaſe**.

THIS INDENTURE, &c. BETWEEN the within-named Abel Atkins, of the one part, and the within-named Brian Bell, of the other part, WITNESSETH, That for and in conſideration of the rent hereby reſerved, and of the covenants, conditions and agreements reſpectively hereinafter contained, which on the part and behalf of him the ſaid Brian Bell, his executors, adminiſtrators and aſſigns, are to be paid, done, and performed: He the ſaid Abel Atkins DOTH demiſe, leaſe, and to farm let, unto the ſaid Brian Bell, his executors, adminiſtrators and aſſigns, ALL that piece or parcel of ground, &c. &c. and all and ſingular other the hereditaments and premiſes reſpectively compriſed in the within-written Indenture of Leaſe, and thereby demiſed in manner therein mentioned, (except as therein is excepted). TO HAVE AND TO HOLD the ſaid piece or parcel of ground, &c. and all and ſingular other the hereditaments and premiſes hereby leaſed, ſet, and to farm let, or mentioned or intended ſo to be, (except as aforeſaid), unto the ſaid Brian Bell, his executors, adminiſtrators, and aſſigns, from the feaſt day of ————, which will be in the

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* Where a leaſe is to be renewed; ſome expenſe will be ſaved by the adoption of this precedent, not only in reſpect of the ſtamp duties, but alſo in neceſſary profeſſional charges; which may be of ſome importance where the premiſes are not very extenſive, and conſequently of ſmall annual value.

year of our Lord ——; and when the term granted and demiſed in and by the ſaid within-written Indenture of Leaſe will expire, for and during, and unto the full end and term of 14 years longer from thenceforth next enſuing, and fully to be complete and ended, SUBJECT to and under the like rent, and payable in like manner as is within mentioned, for and in reſpect of the rent reſerved in and by the ſaid within-written Indenture of Leaſe, and ſubject to the like power of entry, as well on non-payment of rent as on the happening of any of the other incidents mentioned in the within-written proviſo or condition of re-entry. AND IT IS HEREBY DECLARED AND AGREED, by and between the parties to theſe preſents, that they and their reſpective heirs, executors, adminiſtrators and aſſigns, ſhall and will by theſe preſents, during the continuance of the additional term of 14 years, hereby granted, ſtand and be bound for and in reſpect of the ſaid hereby demiſed hereditaments and premiſes, with the appurtenances, in ſuch and the like covenants, conditions and agreements reſpectively, as they the ſaid parties and their reſpective heirs, executors, adminiſtrators and aſſigns, do now ſtand bound in and by the ſaid within-written Indenture of Leaſe, for and during the now reſidue to come and unexpired of the within-mentioned term of years, hereby granted, it being the intent and meaning hereof, that this preſent indorſed Indenture of Leaſe, and the additional term hereby granted and demiſed, ſhall be upon ſuch and the like footing, and all the covenants, clauſes, conditions and agreements reſpectively therein contained, be equally available, take place, and have the like force and effect, to all intents and purpoſes, as if every article, clauſe, matter and thing, contained in the ſaid within-written Indenture of Leaſe, were, word for word, repeated and again inſerted in theſe preſents. IN WITNESS, &c.

The foregoing Indorſement was prepared by the great LORD CAMDEN, *while he was Attorney General; and he was of opinion, that it would be juſt as effectual as a new Leaſe, if properly ſtamped.*

Form of an Aſſignment of a Lease by Indorsement.*

To all to whom theſe preſents ſhall come, Suſannah Bowes, of ————, the widow of the within-named Samuel Bowes, and ſole executrix named in his laſt will and teſtament, ſendeth greeting. WHEREAS the ſaid Samuel Bowes, ſince the execution of the within indenture of leaſe, departed this life, having firſt duly made and publiſhed his laſt will and teſtament in writing, and thereof appointed the ſaid Suſannah Bowes ſole executrix and univerſal legatee: AND WHEREAS the within demiſed premiſes and indenture of leaſe were lately put up to ſale by public auction; and Richard Giles, of the pariſh of St. Mary, Iſlington, having attended at ſuch ſale, and offered the ſum of eighty-one pounds for the purchaſe thereof, he was declared

* From the great increaſe of the ſtamp duties, an aſſignment by indorſement, where practicable, is to be recommended.

to be the higheſt bidder for the ſame, and the ſaid premiſes and indenture of leaſe were accordingly ſold to him at and for that ſum: NOW KNOW YE, that for and in conſideration of the ſum of eighty-one pounds of lawful money of Great Britain, to the ſaid Suſannah Bowes in hand paid by the ſaid Richard Giles, at and before the ſealing and delivery of theſe preſents, the receipt whereof is hereby acknowledged; ſhe the ſaid Suſannah Bowes hath bargained, ſold, aſſigned, transferred, and ſet over, and by theſe preſents doth bargain, ſell, aſſign, transfer, and ſet over unto the ſaid Richard Giles, his executors, adminiſtrators, and aſſigns, all that piece or parcel of ground, and all and ſingular other the premiſes in and by the within-written indenture of leaſe demiſed, or mentioned or intended ſo to be, with their and every of their appurtenances; and all the eſtate, right, title, intereſt, term of years to come and unexpired, property, claim, and demand whatſoever, either of the within-named Samuel Bowes, or of her the ſaid Suſannah Bowes, as executrix or otherwiſe, of, in, to, or out of the ſame premiſes, every or any part or parcel thereof, together with the ſaid indenture of leaſe. TO HAVE AND TO HOLD the ſaid piece or parcel of ground, and all and ſingular other the premiſes hereby, or mentioned to be hereby aſſigned, with their and every of their appurtenances, unto the ſaid Richard Giles, his executors, adminiſtrators, and aſſigns, from the Feaſt-Day of the Birth of our Lord Chriſt, next enſuing the date hereof, for and during all the reſt, reſidue, and remainder, which ſhall be then to come and unexpired, of the term of ſixty-one years, in and by the within-written indenture of leaſe granted thereof; SUBJECT nevertheleſs to the payment of the rent and performance of the covenants in the ſame indenture of leaſe, reſpectively reſerved and contained on the tenant or leſſee's part, from thenceforth to be paid, done, and performed: AND the ſaid Suſannah Bowes doth hereby, for herſelf, her heirs, executors, and adminiſtrators, covenant, promiſe, and agree, to and with the ſaid Richard Giles, his executors, adminiſtrators, and aſſigns, in manner following, (that is to ſay) —that he the ſaid Richard Giles, his executors, adminiſtrators, or aſſigns, paying the rent, and obſerving and performing the covenants and agreements reſerved and contained in and by the ſaid within-written indenture of leaſe, on the tenant or leſſee's part, to be paid and performed, from and after the ſaid Feaſt of the Birth of our Lord Chriſt next enſuing the date hereof, ſhall and may from time to time, and at all times thereafter, for and during all the reſidue and remainder which ſhall be then to come and unexpired of the ſaid term of ſixty-one years by the within-written indenture of leaſe granted, lawfully, peaceably, and quietly have, hold, occupy, poſſeſs, and enjoy the ſaid piece or parcel of ground and premiſes hereby aſſigned, or intended ſo to be, with their and every of their appurtenances, and receive and take the rents, iſſues, and profits thereof, and of every part thereof, to and for his and their own uſe and benefit, without any lawful let, ſuit, trouble, denial, eviction, or interruption, of or by the ſaid Suſannah Bowes, her executors, adminiſtrators, or aſſigns, or any other perſon or perſons whomſoever, lawfully claiming or to claim, by, from, or under her, them, or any of them, or by or through her or their act, means, neglect, default, or procurement; AND that free and clear, and freely and clearly acquitted and diſcharged, or otherwiſe, by the ſaid Suſannah Bowes, her executors, or adminiſtrators, well and ſufficiently ſaved, kept harmleſs, and indemnified of, from, and againſt all and all manner of former and other deeds, gifts, grants,

bargains, ſales, aſſignments, mortgages, ſurrenders, re-entries, judgments, executions, extents, ſtatutes, recognizances, and all other incumbrances whatſoever; AND of and from all arrears of rent, taxes and aſſeſſments, until the ſaid Feaſt-Day of the Birth of our Lord Chriſt now next enſuing. AND FURTHER, that ſhe the ſaid Suſannah Bowes, her executors or adminiſtrators, and all and every other perſon and perſons, having or lawfully claiming, or to claim, any eſtate, right, title, or intereſt, of, in, to, or out of the ſaid hereby aſſigned premiſes, or any part thereof, from, by, under, or in truſt, either for the within-named Samuel Bowes, or for her the ſaid Suſannah Bowes, her or any of her executors or adminiſtrators, ſhall and will, from time to time, and at all times during the continuance of the ſaid term hereby aſſigned, upon every reaſonable requeſt, and at the coſts and charges in the law of him the ſaid Richard Giles, his executors, adminiſtrators, or aſſigns, make, do, and execute, or cauſe and procure to be made, done, and executed, all and every ſuch further and other lawful and reaſonable acts, conveyances, and aſſurances in the law whatſoever, for the further, better, and more perfect aſſigning and aſſuring the ſaid premiſes unto the ſaid Richard Giles, his executors, adminiſtrators, and aſſigns, for the then reſidue of the term within demiſed, as by the ſaid Richard Giles, his executors, adminiſtrators, or aſſigns, or his or their counſel learned in the law, ſhall be reaſonably deviſed, or adviſed and required. IN WITNESS, &c.

Form of an Agreement for a House and Land; and to grant a Lease at the End of the Term, if required.

BE IT REMEMBERED that it was this —— day of ————, in the year of our Lord 1804, mutually agreed, by and between Abel Atkins, of ————, of the one part, and Brian Bell, of ————, of the other part, in manner and form following; that is to ſay, HE the ſaid Abel Atkins HATH agreed, and, by this preſent agreement in writing, DOTH agree to demiſe and let unto the ſaid Brian Bell, AND the ſaid Brian Bell HATH agreed, and by theſe preſents DOTH agree to take, hold, and enjoy ALL that meſſuage or tenement, with the garden, orchard, and appurtenances thereunto belonging, ſituate, lying, and being in the pariſh of ————, in the county of ————, now or late in the occupation of ————, together with all that field or cloſe of meadow land, containing by eſtimation 10 acres, little more or leſs, ſituate, lying, and being in ———— aforeſaid, called or known by the name of ————, now or late in the occupation of ———, together with all ways, paths, paſſages, waters, watercourſes, eaſements, privileges, and advantages whatſoever thereunto belonging, from the —— day of ———, for and during the term of —— years from thence next enſuing; THE ſaid Brian Bell yielding and paying the ſum of ————, of lawful money of Great Britain, clear of all deductions whatſoever, for or on account of any parliamentary, parochial, or other rates, taxes, or aſſeſſments, yearly and every year during the ſaid term, by four equal quarterly payments, on the reſpective days following; that is to ſay, the Annunciation of the Bleſſed Virgin Mary, the Nativity of St. John the Baptiſt, the Feaſt of St. Michael the Archangel, and the Birth of our

Lord Chriſt. AND alſo yielding and paying, by the ſaid Brian Bell, the ſaid clear yearly ſum or rent of ————, in like manner for and during the time that the ſaid Brian Bell ſhall hold and enjoy the ſaid meſſuage or tenement and its appurtenances, and the ſaid field or cloſe of meadow land, with its appurtenances, after the expiration of the ſaid term for which they are hereby let, by equal quarterly payments, on the reſpective days and times aforeſaid. AND it is further agreed, that the ſaid Abel Atkins ſhall, on or before the —— day of ———— next, put into good and tenantable repair and condition the ſaid meſſuage or tenement, with its appurtenances; and on or before the day aforeſaid put the hedges, fences, mounds, ditches, and watercourſes of and in or belonging to the ſaid field or cloſe, in good repair, ſtate, order and condition. IT IS ALSO AGREED, that the ſaid Brian Bell ſhall for and during the time he ſhall hold, or occupy and enjoy the ſame, keep the ſame meſſuage or tenement, with its appurtenances, in good and tenantable repair, reaſonable uſe and wear excepted, and maintain, preſerve and keep the hedges, fences, mounds, ditches, and watercourſes of and in or belonging to the ſaid field or cloſe in good repair, ſtate, order, and condition. AND it is further agreed, that if the ſaid Brian Bell ſhall or do, at any time or times hereafter, without the authority or licence of the ſaid Abel Atkins for that purpoſe in writing firſt had and obtained, underlet or aſſign over all or any part of the ſaid meſſuage or tenement and its appurtenances, or all or any part of the ſaid field or cloſe and its appurtenances, to any perſon or perſons whomſoever; IT ſhall and may be lawful to and for the ſaid Abel Atkins, either by himſelf or his agent, immediately to re-enter and re-poſſeſs, re-occupy and enjoy the ſaid meſſuage or tenement, with its appurtenances; and alſo the ſaid field or cloſe of meadow land, and all and ſingular other the premiſes hereby demiſed and let, as if this agreement had never been made or entered into. AND the ſaid Abel Atkins hereby agrees, that if the ſaid Brian Bell ſhall be minded or deſirous to take a leaſe of the ſaid meſſuage or tenement, with its appurtenances, and the ſaid field or cloſe of meadow land, with its appurtenances, after the expiration of the ſaid term of —— years, for the further term of —— years, at the clear yearly rent of ————, payable quarterly as aforeſaid, the ſaid leaſe to contain the uſual and cuſtomary covenants, he the ſaid Abel Atkins ſhall and will, in due form, grant and execute to the ſaid Brian Bell ſuch leaſe for ſuch further term, at ſuch rent, and payable as aforeſaid; the coſts and charges of preparing and executing of the ſaid leaſe to be equally borne, defrayed and diſcharged by and between the ſaid parties: Provided that the ſaid Brian Bell do and ſhall give the ſaid Abel Atkins notice in writing, of ſuch his wiſh or deſire, full three calendar months before or prior to the expiration of the ſaid term of years for which the ſaid premiſes are, by this preſent agreement, demiſed and let. AS WITNESS our hands the day and year firſt above written.

CHAP. III.

Of the Duration of Leases; and herein of the Means by which they may be determined.

THE continuation or duration of leaſes for years ought to be aſcertained and fixed, by the particular limitation of the parties, at the time of the leaſe made; and a leaſe may be determined, either by the term expiring, for which the premiſes were leaſed, or by the happening of a particular contingency; ſuch as by ſurrender to the landlord, or forfeiture for the breach of ſome covenant, expreſs or implied.

But the moſt uſual way in which a leaſe determines, is by the effluxion of time, that is, by the period expiring for which the lands were demiſed, or upon a contingency happening that was to create, as it were, ſuch period; ſuch as the caſe of a notice to determine at the expiration of the firſt ſeven years of the term, or the like, where a power has been reſerved for that purpoſe.

A leaſe for years is alſo determined, and at an end, by what the law terms a *merger* of intereſt; that is, where the tenant purchaſes the freehold, or the immediately ſuperior intereſt of his landlord; then the leaſe merges or ſinks, and is loſt or drowned, in the greater eſtate and intereſt, which the tenant takes by his purchaſe.

Another mode, by which a leaſe may be made to determine, is by ſurrender; that is, by yielding up to the landlord the leaſe, and eſtate and intereſt derived thereby; by which means the ſubordinate eſtate of the tenant is alſo merged in the greater eſtate of the landlord.

But by the ſtatute of frauds and perjuries, 29 *Car.* 2. c. 3. no leaſes, eſtates or intereſts for *term of years* ſhall be ſurrendered, unleſs it be by deed or note in writing, ſigned by the party who makes ſuch ſurrender, or ſome other lawfully authorized thereunto, or by act and operation of law.

A fourth means whereby a leaſe may be determined, is by cancelling the deed by which it is granted; for, whatever doubts may have been formerly entertained as to the effect of eraſing, or otherwiſe annulling, a leaſe for years, yet at this day, ſince the ſtatute of frauds and perjuries, *Stat.* 29 *Car.* 2. *c.* 3. which makes all leaſes for above three years (Vide this Appendix, p. 802) to have only the force and effect of leaſes at will, unleſs they be in writing and ſigned by the party: the deed or writing, whereby ſuch leaſe is made, ſeems to be of the ſame eſſence as the leaſe itſelf; and therefore the cancelling or deſtruction of that, ſeems to deſtroy and avoid the leaſe itſelf, *becauſe it deſtroys all evidence allowed by law for the ſupport thereof:* though, in ſuch caſe, Chancery frequently ſets up the leaſe again, or decrees the party to execute a new one for the reſidue of the term; which is not againſt the prohibition of the act; becauſe there was once a good and effectual leaſe made purſuant to the ſtatute. But here it muſt be underſtood that the Court of Chancery will not interfere in a fair and *bonâ fide* tranſaction, but only in caſes where the cancel has been obtained by fraud.

A leaſe may alſo be determined by force of any condition indorſed on the back of the deed,

if it were ſo indorſed and ſigned, before the enſealing and delivery, as well as by force of a condition contained in the body of the deed.

The laſt mode by which a leaſe may be determined is by forfeiture; and any act by which the tenant diſaffirms or denies the title of his landlord is a forfeiture:

As where he ſues out a writ, or reſorts to a remedy which claims the freehold or ſuperior eſtate of his landlord—or where, in an action by his landlord upon the leaſe or letting of the premiſes, he defends under the grant of a greater intereſt in the land, or acknowledges the title to be in a ſtranger, or attempts to alien or convey in fee.

Alſo a forfeiture may be incurred by the breach of expreſs or implied covenants; but, as the Courts always lean againſt forfeitures, the landlord cannot take any advantage of any forfeiture, if he has afterwards done any act that amounts to a waiver of it: however, the forfeiture muſt in fact be known to the landlord at the time, in order to render his acceptance of rent or any other act a waiver.

CHAP. IV.

Of Rent and Taxes.

THE reſervation of rent ought to be certain; for, if a man demiſe lands, rendering *after the rate* of £. 20 per annum while the leaſe continues, it will be void: for it does not appear what rent he ſhall pay in certain, or at what time. And the rent muſt be reſerved to the landlord himſelf, and not to a ſtranger.

If the landlord die before the laſt inſtant of the rent day, the rent will go along with the land to the heir at law, or to him who is next entitled, and not to the executor or adminiſtrator; becauſe the tenant has till the laſt inſtant to pay his rent; and conſequently, if the landlord die before it is completely due, his executors or adminiſtrators can make no title to it.

Where a time certain is appointed for the payment of rent, neither the tenant nor the landlord is bound to attend to any other time; and if the thing be to be done on a day certain, but no hour of the day is ſet down, wherein the ſame ſhall be done, in this caſe they muſt attend ſuch a diſtance of time before ſun-ſet as may be convenient to count the money.

If the landlord enter into any part of the premiſes demiſed, the rent is ſuſpended; but if he enter by virtue of a power reſerved, or as a mere treſpaſſer, yet if the tenant be not evicted, it will be no ſuſpenſion of the rent.

The landlord's remedies for the recovery of rent in arrear, are, firſt, by diſtreſs and ſale of the goods of the tenant ſtanding on the demiſed premiſes; ſecondly, by action of debt, where the leaſe is by deed; thirdly, by action of covenant, where the leaſe is by deed; fourthly, by action of debt or aſſumpſit, for the uſe and occupation of the premiſes where they are not held by deed.

Reſpecting the liability of the landlord or tenant to pay taxes, whether they be parliamentary taxes or parochial rates, it is a general principle that the occupier of the premiſes is liable.

But the land-tax acts from the 4th of W. & M. c. 1. ſ. 13. to the 38th Geo. 3. c. 2. ſ. 17. & 35. (when the ſame was made perpetual), direct the tenant to pay the land-tax in the firſt inſtance,

and to deduct out of the rent ſo much of the rate as in reſpect of the ſaid rent the landlord ſhould and ought to pay and bear; and the landlords, both mediate and immediate, according to their reſpective intereſts, are required to allow ſuch deductions.

And under a leaſe in which rent was reſerved to be paid *without any deduction or abatement whatſoever*, it was held that, as the land-tax act enables the tenant to deduct that tax out of his rent, he has in all caſes a right to ſtop it, unleſs there is an expreſs agreement to the contrary.

The poors rate, alſo, is a charge upon the occupier, in regard to his poſſeſſion, and not on the landlord, in regard to the rent received; and if a man does not live within a pariſh, he is to be aſſeſſed according to his land; but if he live within the pariſh, he is to be rated as dwelling there.

CHAP. V.

Of Tithes; and herein of the Manner of ſetting out and taking the ſame, conformable to the Statutes and adjudged Caſes reſpecting Tithes.

TITHES are either *prædial*, *perſonal*, or *mixt*; and theſe are divided into *great* or *ſmall* tithes.

1. The PRÆDIAL TITHES are ſuch as ariſe from the land ſpontaneouſly or by manurance; as tithe of corn, hay, wood, herbs, wine, flax, hops—and fruits; ſuch as apples, pears, and the like.

2. MIXT TITHES are ſuch as ariſe from cattle and beaſts receiving their nouriſhment upon the land; and are therefore due in reſpect of calves, lambs, kids, pigs, wool, milk, cheeſe, eggs, and the like.

3. PERSONAL TITHES are the tenth part of the clear gain which is raiſed from the perſonal labour of a man, his charges and expenſes according to his condition and degree being deducted; but theſe are only payable in ſuch places as had accuſtomably for forty years before the ſtat. 2 and 3 Ed. 6. c. 13. paid perſonal tithes.

And by that ſtat. neither day labourers are obliged to pay perſonal tithes, nor, according to 1 Roll's Abridgment, p. 646, fol. 25, huſbandry ſervants, in reſpect of their wages.

4. Other eccleſiaſtical revenues uſually conſidered with tithes, as part of the inheritance of the Church, are oblations or obventions, penſions and mortuaries.

And they are either voluntary, or due by cuſtom at a certain time—as upon marriage, baptiſm, purification of women, funerals, or the like.

And by the ſtat. 2 and 3 Ed. 6. c. 13. all who by the laws and cuſtoms of the realm ought to pay offerings, ſhall yearly pay them at the four moſt uſual days, or otherwiſe at Eaſter.

5. GREAT TITHES are chiefly of wood, corn, or hay; and SMALL TITHE are in general, unleſs there has been an immemorial uſage to the contrary, all other prædial tithes, beſides corn, hay, and wood; and likewiſe thoſe tithes which are mixed and perſonal.

6. Of the Produce of the Earth:—The tithes are to be ſet out and taken in manner following:

Wheat and rye; by the tenth ſhock, and by the tenth ſheaf.

Barley and oats; by the tenth cock or ſhock, and alſo the tenth ſheaf.

Beans, peaſe, tares, and all other pulſe; by the tenth cock, heap, or bundle.

Stubble; wheat ſtubble, employed in purpoſes of huſbandry and tillage of the lands of the farm on which it grew, yields no tithe, but if ſold or otherwiſe diſpoſed of, then by the tenth of its value.

Hay, clover, and other artificial graſſes; by the tenth cock of the firſt mowing, and alſo of the ſecond when made into hay.

After-mowth of graſs clover or other artificial graſſes; if eaten by barren and unprofitable ſtock, by an agiſtment tithe.

Hobbings of graſs in paſture; by the tenth cock.

Seeds of clover, artificial graſſes, and alſo turnip, cole, and rape-ſeed; if grown for ſeed, by the tenth meaſure of the ſeed when thraſhed out; or if ſold, by the tenth of what it ſold for.

Turnips; if pulled, by every tenth turnip or heap.

Turnips, rape, and cole; if eaten, whether by profitable or unprofitable ſtock, by an agiſtment tithe; if ſold, by the tenth of their value.

Barren lands; titheable when cultivated.

Flax, hemp, and madder.—The tithes thereof are aſcertained at five ſhillings per acre, and ſo in proportion for ſmall quantities.

Woad or woald; by the tenth heap or gathering.

Saffron; by a tenth, when gathered, though only once in three years.

Hops; by a tenth part of the whole after picking; that is, after pulled from the bine.

Potatoes and other roots growing in fields; by a tenth of their produce when taken up.

Gardens; by a tenth of their produce.

Orchards; by a tenth of their produce, whether windfalls or gathered.

Nurſery-grounds. Their produce, whether fruits or plants, indigenous or exotic, if ſold in the way of trade, by a tenth, or tenth of their value

Timber-wood or charcoal; that is, oak, aſh, and elm, above twenty years growth, yield no tithe, except when cut down and ſold as fire-wood, or converted into charcoal.

Other wood. All other wood of any growth, by a tenth, according to the quantity cut down, whether ſold or not, except in counties where timber-wood is ſcarce, and any other wood is ſubſtituted, as beech and the like.

Oſiers and willows; by the tenth bundle or pole, when cut.

Underwood. Underwood, coppice-wood, loppings and toppings of old bowlings, loppings and toppings of trees, reeds, and germins, cut from ſtumps of trees, though above twenty years growth, by a tenth of their quantity when cut.

Hedge-rows and gorſe or furze; if ſold or not, uſed upon the farm on which they grow, by every tenth kid or faggot.

7. Of Sheep. The tithes are to be taken in manner following:

Lambs; by every tenth lamb, to be taken away when able to live upon the ſame food the dam doth; and the tenth of the value of the odd numbers: if ſold upon the fall, the tenth of what they ſold for: bought in and put to ewes, by an agiſtment tithe, to be computed from the time of weaning, unleſs kept until clip-day and clipped.

Ewes and lambs; fold or removed out of the pariſh before clip-day, by an agiſtment tithe, to be computed from the laſt clip-day.

Feeding ſheep-ſhearlings, or hogs bred or bought in; by an agiſtment tithe, if fold or removed before clip-day, to be computed from the laſt clip-day; but if bought in from that day, until fold or removed.

Sheep; bought in and kept until clip-day, by the tenth weight of their wool.

Sheep dying. Dying after clip-day of the rot or otherwiſe, whether bought in or bred upon the farm, by an agiſtment tithe; to be computed from the laſt clip-day, if bred on the farm; but if bought in, from that time until they died.

Ewes removed out of the pariſh to lamb; by the tenth lamb, according to the number of ewes, and by the tenth of the value for the odd numbers.

Ewes or other ſheep removed out of the pariſh to be clipped; by the tenth fleece, according to the number of ſheep removed, and by the tenth of the weight of the odd fleeces.

Wool; by the tenth weight at the time of clipping.

Belts and locks; by the tenth weight when waſhed and dried.

8. Of Beasts. The tithes are to be taken in manner following:

Calves; by the tenth, if ten; to be taken at the time of weaning, and by a tenth of the value of all above or under ten; if one or more, and ſold upon the fall, or fed for the butcher, by the tenth of the price ſold for, and in the ſame manner for all above ten.

Calves reared for the plough or pail yield no tithe; but if ſold or removed before they are worked or milked, by an agiſtment tithe, to be computed from the time they become yearlings, until ſold or removed.

Working beaſts yield no tithe while working, unleſs they work for hire or profit, or are employed in another pariſh than that in which the owner lives; then by an agiſtment tithe.

Beaſts turned off to feed; by an agiſtment tithe, to be computed from the day turned off until ſold or removed.

Cows ſold before calving or dying; by an agiſtment tythe, to be computed from the time they were let dry until they were ſold or die.

Beaſts bought in and ſold again; by an agiſtment tithe, to be computed from the day bought in, until ſold, except when kept in the ſtraw-yard, and fed with ſtraw; but no exception if fed with hay, though the hay had before paid tithe.

Milk; by the whole of the milk milked on each tenth natural day, as well in the morning as in the evening, to be computed from the time the firſt cow, after calving, is brought to the pail and milked; and ſo of every cow after calving, and no regard is paid to what they eat.

The cow keeper is to give notice to the tythe-owner when and where he goes to milk his cows, and the tithe is to be fetched by him from the place where the cows are milked, unleſs there

be a cuſtom in the pariſh for the cow-keeper to deliver it to the tithe-owner elſewhere, or at the church porch; and unleſs he milk his cows in another pariſh than that in which they are fed; for the tithe of milk is payable to the tithe-owner of the pariſh in which the cows are fed, and not in that in which they are milked; in which caſe he is not obliged to fetch it, but the cow-keeper muſt bring it to the tithe-owner.

9. Of Horses. The tithes are taken in the following manner:

Foals; by the tenth, if ten, to be taken at the time of weaning, and by the tenth of the value of all above or under ten, if ſold, before uſed for the plough, by an agiſtment tithe, to be computed from the time they become yearlings until ſold or removed.

Horſes kept for working the farm yield no tithe while working; but if uſed for hire or profit, or employed in another pariſh than that in which the owner lives, then by an agiſtment tithe.

Saddle and pleaſure horſes. Saddle horſes, and horſes uſed for pleaſure only, yield no tithe, but if uſed for hire or profit, by an agiſtment tithe.

Horſes turned up or bought to feed for ſale; by an agiſtment tithe, to be computed from the time turned up or bought in until ſold or removed.

Brood mares and horſes taken in to feed or agiſt at ſo much per week, by an agiſtment tithe for the time kept.

It is to be obſerved, that the true object of agiſtment is not the improvement of the animal, but the tenth of what the land is worth to let, for taking in the cattle of another perſon to agiſt; and land on which cattle is fed for ſlaughter ſhould be rated at double the value of the land on which ſtore cattle is fed.

10. Of Pigs, the tithes are to be taken by the tenth pig, if ten, to be taken at the time of weaning, and for all above or under ten, the tenth of the value thereof at weaning.

Bought in and ſold again, by the tenth of the clear profit thereof.

11. Of Rabbits and Deer. Rabbits, if ſold, by the tenth of both ſkin and carcaſe at every killing; and in like manner deer alſo will yield a tithe, if ſold for profit, although *feræ naturæ.*

12. Of Fish no tithe is payable, except in certain places by immemorial uſage.

13. Of Pigeons the tithe is taken by the tenth of the value of all pigeons when ſold.

Pigeon manure, if not uſed on the farm, but ſold, is alſo titheable by the tenth of the value ſold for.

14. Of Wild Fowl taken in decoys and ſold for profit, the tithe is taken by the tenth of the value when ſold.

15. Of Honey and Wax the tithe is taken by the tenth meaſure of honey, and the tenth weight of wax.

16. Of Eggs the tithe is taken by the tenth egg of all turkeys, hens, geeſe, ducks, or any other domeſticated fowl, and by the tenth weight of the feathers of geeſe.

17. Of Mills, the tithe of corn-mills ſhall be paid of the clear yearly gains and profits, after deducting rent, ſervants' wages, repairs, and other real expences, except of ancient mills erected before the 9th year of Edward the Second.

18. Other PARISH DUES, payable to the miniſter of the pariſh, conſiſt of Eaſter offerings, mortuaries, and ſurplice fees.

Eaſter offerings are payable for every perſon in the pariſh of ſixteen years of age and upwards, by the maſter or miſtreſs of a family, after the rate of two-pence per head.

Mortuaries are for every perſon dying in the pariſh, poſſeſſed of moveable goods to the value of forty pounds and upwards, his debts firſt paid—10s.

If to the value of thirty pounds, and under forty pounds—6s. 8d.

If to the value of ſix pounds thirteen and four-pence, and under thirty pounds—3s. 4d.

Except for beneficed clergymen, for whom a mortuary is only due to the biſhop of the dioceſe wherein he held his benefice and reſided.

Surplice fees are payable for every marriage, whether by licenſe or by banns, for every funeral, and for every churching, according to the cuſtom of the pariſh.

CHAP. VI.

Of the Highway Duty.

1. *What perſons are compelled to perform ſtatute duty.*] The ſurveyor, together with the inhabitants and occupiers of lands, tenements, woods, tithes, and hereditaments, within each pariſh, ſhall, at proper ſeaſons in every year, uſe their endeavours for the repair of the highways, and ſhall be chargeable thereunto, as followeth; that is to ſay:

Every perſon *keeping a waggon, cart, wain, plough, or tumbrel, and three or more horſes or beaſts of draught* uſed to draw the ſame, ſhall be deemed to keep a team, draught, or plough, and be liable to perform ſtatute-duty with the ſame, in the pariſh where he reſides, and ſhall, ſix days in every year, (if ſo many ſhall be found neceſſary) to be computed from *Michaelmas* to *Michaelmas*, ſend on every day, and at every place, appointed by the ſurveyor for the amending the highways in ſuch pariſh, one wain, cart, or carriage, furniſhed after the cuſtom of the country, with oxen, horſes, or other cattle, and all other neceſſaries fit to carry things for that purpoſe, and alſo two able men with ſuch wain, cart, or carriage; which duty ſo performed ſhall excuſe ſuch perſon from his duty in ſuch pariſh, in reſpect of all lands, &c. not exceeding the annual value of £. 50, which he ſhall occupy therein, 34 Geo. III. c. 74. ſ. 4.

And every perſon keeping ſuch team, draught, or plough, and occupying in the ſame pariſh lands, &c. of the yearly value of £. 50 beyond the ſaid yearly value of £. 50 in reſpect whereof ſuch team-duty ſhall be performed;—and every ſuch perſon occupying lands, &c. of the yearly value of £. 50 *in any other pariſh*, beſides that wherein he reſides:—And every other perſon not keeping a team, draught, or plough, but occupying lands, &c. of the yearly value of £. 50 in any pariſh,—ſhall, in like manner, and for the ſame number of days, find and ſend one wain, cart, or carriage, furniſhed with not leſs than three horſes, or four oxen and one horſe, or two oxen and two horſes, and two able men to each wain, cart, or carriage; and, in

like manner, for every £. 50 *per annum*, which every ſuch perſon ſhall further occupy, in ſuch pariſh, 34 Geo. III. c. 74. ſ. 4.

Such wains, carts, or carriages, to be employed by the ſurveyor in repairing the highways within the pariſh where ſuch lands, &c. lie, 34 Geo. III. c. 74 ſ. 4.

And every perſon *who ſhall not keep a team, draught, or plough*, but ſhall occupy lands, &c. under the yearly value of £. 50 in the pariſh where he reſides, or in any other pariſh,—and every perſon keeping a team, draught, or plough, and occupying lands, &c. under the yearly value of £. 50 in any other pariſh than that wherein he reſides,—ſhall contribute to the repair of the highways, and pay to the ſurveyor of ſuch pariſh, in lieu of ſuch duty, the ſums following, viz. "For every 20s. of the annual value of ſuch lands, &c. 1d. for every day's ſtatute-duty which ſhall be required and called for by the ſurveyor of ſuch pariſh in every year, not exceeding ſix days duty in the whole; and every ſuch perſon reſpectively ſhall, in like manner, pay 1d. for every 20s. of the annual value of the lands, &c. which he ſhall occupy in ſuch pariſh, above the annual value of £. 50, and leſs than £. 100, and ſo for every 20s. that each progreſſive and intermediate annual value of 20s. of the lands, &c. which he ſhall ſo occupy, ſhall fall ſhort of the further increaſe of £. 50 in every pariſh where ſuch lands, &c. lie, for every day's ſtatute-duty required as aforeſaid," 34 Geo. III. c. 74. ſ. 4.

Which ſaid ſums ſhall be conſidered as compoſitions, and ſhall be paid to the ſurveyor of the pariſh in which they are charged, for the uſe of the highways therein, at the time ſuch compoſitions are to be paid under ſtat. 13 Geo. III. c. 78*, or within ten days after; or in default of ſuch payments, the ſurveyor ſhall make application to a juſtice of the diſtrict, who ſhall ſummon the party ſo making default to appear at ſome ſpecial or petty ſeſſions, to be holden for ſuch diſtrict, and at which two juſtices at the leaſt ſhall be preſent, to ſhow cauſe why he has refuſed or neglected to pay ſuch compoſition-money; and in default of appearance, or if on appearance he ſhall not make it appear that he is poor and indigent, and as ſuch is an object deſerving of relief; ſuch money ſhall be levied by diſtreſs and ſale of the goods of the perſon refuſing to pay the ſame, as the forfeitures for the neglect in performing the ſtatute-duty are to be levied, 34 Geo. III. c. 74. ſ. 4.

But when, on application as above mentioned, the juſtices ſhall think proper to diſcharge any poor or indigent perſon from payment, ſuch perſon ſhall, at the ſame time, be diſcharged from any expenſes ariſing from his ſummons and appearance, 34 Geo. III. c. 74. ſ. 4.

Provided that no perſon keeping ſuch team, &c. and performing duty with the ſame, in the pariſh where he reſides, and not occupying lands, &c. within the ſame, of the yearly value of £. 30, ſhall be obliged to ſend more than one labourer with ſuch team, &c. 34 Geo. III. c. 74. ſ. 4.

But by 42 Geo. III. c. 90, No ſerjeant, corporal, or drummer of the militia, nor any private man, from the time of his inrolment until his diſcharge, ſhall be obliged to perform any highway duty, commonly called ſtatute-work, ſ. 174.

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* For this ſee 13 Geo. III. c. 78. ſ. 41. in p. 1248 *infra*.

And if the ſaid teams, draughts, or ploughs, ſhall not be thought needful by the ſurveyor, on any of the ſaid days, then ſuch perſon who ſhould have ſent any ſuch team, &c. according to the directions aforeſaid, ſhall, according to the notice to be given, as after directed, ſend unto the ſaid work, for every one ſo ſpared, three able men, there to labour as aforeſaid,—or to pay to the ſaid ſurveyor 4s. 6d. in lieu thereof, 34 Geo. III. c. 74. ſ. 4.

And it ſhall be lawful for the ſurveyor, where the employment for teams is of ſuch ſort that two horſes will be ſufficient for one cart, or where a ſtand cart with one horſe ſhall be neceſſary, to call upon any perſon liable to ſend a team, draught, or plough, who keeps carts, and three horſes, to ſend ſuch carts, or horſes, to perform his ſtatute-duty, as the ſurveyor ſhall direct; and the ſurveyor ſhall allow every ſtand cart and one horſe as half a team, and every cart and two horſes as two-thirds of a team; and if a waggon ſhall be found neceſſary for any particular buſineſs, the ſurveyor may require the duty, or part thereof, to be performed with ſuch waggon, by any perſon who keeps one; which direction ſhall be obſerved, or the perſon liable to perform duty, ſhall forfeit ſuch ſum as the duty required of him ſhall bear, in proportion to the forfeiture inflicted for every neglect in performing duty with a team, draught, or plough, ſ. 36.

2. *In what manner the ſtatute duty is to be performed.* The ſurveyor ſhall give to, or cauſe to be left at the abode of every perſon liable to perform ſuch duty, four days notice at leaſt of the day, hour, and place, upon which each of the days' duty ſhall be to be performed, 13 Geo. III. c. 78. ſ. 37.

And all perſons ſhall have and bring with them ſuch ſhovels, ſpades, picks, mattocks, and other tools, as are uſeful, 34 Geo. III. c. 74. ſ. 2.

And all the ſaid perſons and carriages ſhall diligently perform the work to which they ſhall be appointed by ſuch ſurveyor for eight hours in every day, within ſuch pariſh, or in getting materials in and from any other pariſh, to be employed in the repair of the highways of the pariſh, for which they ſhall perform duty, 34 Geo. III. c. 74. ſ. 2.

And if any perſon ſending a team ſhall not ſend a ſufficient labourer beſides the driver (except as before mentioned), or if any ſuch labourer or driver, or any other labourer, or the driver of any cart, ſhall refuſe to work, during the time above mentioned, according to the directions of the ſurveyor; or if any driver ſhall refuſe to carry proper loads, it ſhall be lawful for ſuch ſurveyor to diſcharge ſuch team, cart, or labourer, and to recover from the owner the forfeiture which ſuch perſon would have incurred, in caſe no ſuch team, &c. had been ſent, 34 Geo. III. c. 74. ſ. 2.

And every perſon making default in finding and ſending each wain, cart, or carriage, furniſhed as aforeſaid, and ſuch able men with the ſame, as herein required, or in performing the ſaid duty in manner by this act directed, ſhall, for every default, forfeit 10s.—For every default in ſending a cart with one horſe and one man, 3s.—and for not ſending a cart with two horſes and one man, 5s.—And every perſon making default in ſending ſuch labourer, and every perſon making default in performing ſuch labour at the time and place, and in manner

directed by this act, or in paying compoſition-money for the ſame, ſhall, for every ſuch neglect, forfeit 1s. 6d.; all which forfeitures ſhall be applied for the uſe of the highways within the pariſh, 13 Geo. III. c. 78. ſ. 37.

And the ſurveyor ſhall equally demand ſuch duty from every perſon liable, without favour, ſ. 37.

And if in any pariſh it ſhall not be neceſſary to call forth the whole duty in any year, it ſhall be abated in proportion amongſt all perſons liable, ſ. 37.

And the ſurveyor ſhall, with all ſpeed, after default made in performance of ſuch duty, proceed for the recovery of the penalties, as after directed, ſo that the ſame may be recovered before he makes up his accounts, ſ. 37.

But to prevent as much as poſſible any inconvenience to perſons liable to perform ſtatute-duty, it ſhall be lawful for the inhabitants of every pariſh, at ſome veſtry, or public meeting, to appoint three months in every year, within which no ſtatute duty ſhall be performed, *viz.* one month in the ſpring, called *the ſeed month*, one month in ſummer for *the hay harveſt*; and one other month in the ſummer, for *corn harveſt*: provided notice in writing be given of the times appointed to the ſurveyor of ſuch pariſh, and alſo to the ſurveyor of every turnpike road within the ſame, within three days after ſuch meeting, and fourteen days before the beginning of each of ſuch months, ſ. 43.

3. *Compoſitions in lieu of ſtatute-duty.*] Any perſon liable to perform the ſaid duty, by ſending teams, or draughts, or ploughs, with men, horſes, or oxen, may compound for the ſame, if they think fit, by paying to the ſurveyor, as after mentioned, ſuch money as the juſtices for the limit wherein ſuch pariſh ſhall be, at the ſpecial ſeſſions, to be held in the firſt week after Michaelmas quarter ſeſſions in every year, ſhall adjudge reaſonable, not exceeding ſix, nor leſs than three ſhillings, for each team, draught, or plough for each day; and in default of their adjudging the ſame, 4s. 6d. in lieu of every day's duty for each team, &c.—and for every cart and one horſe, or beaſt of draught, 2s.—and for every cart and two horſes, or beaſts of draught, 3s. in lieu of every day's duty, 34 Geo. III. c. 74. ſ. 3.

And whereas it may frequently happen, that perſons wholly gaining their livelihood by the wages of daily labour, and occupying rateable tenements within a pariſh, by reaſon of age, ſickneſs, a numerous family, or misfortune, may be in poor and indigent circumſtances, and it may be expedient in certain caſes to diſcharge ſuch perſons from all rates, aſſeſſments, or compoſitions whatſoever; it is therefore ENACTED that, on the application of any poor and indigent perſon to be diſcharged from the rate or compoſition made, to any two juſtices, at any ſpecial or petty ſeſſions, held for the limits wherein ſuch poor and indigent perſon ſhall reſide; the ſaid juſtices (having firſt given notice to the ſurveyor to appear on the part of the pariſh) ſhall inquire and examine into the ſituation and circumſtances of the perſon making ſuch application; and if it ſhall appear to the ſatisfaction of ſuch juſtices that ſuch perſon is really poor and indigent, and a deſerving object of ſuch relief, the ſaid juſtices may exempt ſuch poor and indigent perſon from the payment of all rates, aſſignments, or compoſitions whatſoever, 34 Geo. III. c. 74. ſ. 5.

But if it appear to the juſtices, at their ſpecial ſeſſions, to be held in the week next after Michaelmas quarter ſeſſions, or at any other ſpecial or petty ſeſſions, held within the limits of any pariſh at which two or more juſtices ſhall be preſent, that, from the directions before given for performing and compounding the ſtatute-duty, there will be difficulty in procuring the neceſſary carriage, or a ſufficient number of labourers for the repair of the highways, in any particular pariſh, within their limits, without paying high prices for the ſame, it ſhall be lawful for ſuch juſtices to order the team duty hereby required, or ſo much thereof as they think fit, to be performed in kind, within every pariſh, &c. except in reſpect of ſuch teams as belong to perſons who do not occupy lands, &c. of the annual value of £.30 within the ſame; and alſo to order all ſuch perſons as ſhall gain their living by the wages of daily labour, or ſuch part of them as they ſhall think fit, to perform ſix days' labour upon ſuch highways in kind, either by themſelves or others, in caſe ſo many days duty ſhall be required, upon being paid for ſuch labour the uſual wages given to labourers in ſuch pariſh, 34 Geo. III. c. 74. ſ. 6.

But if part of ſuch teams or labourers only are required, it ſhall be directed by the ſaid order of the juſtices in ſome given proportion, as one half, third, or fourth part thereof; and the ſurveyor ſhall, in that caſe, at a public veſtry for ſuch pariſh, put the names of all perſons liable to ſend ſuch teams, into one hat or box, and the names of all perſons liable to perform ſuch labour into another hat or box, and ſome inhabitant then preſent ſhall draw out ſuch number from each as ſhall be equal to the proportion ordered by the juſtices, and the perſon drawn ſhall perform ſuch duty in kind for that year; and if ſuch order ſhall be made or continued in the ſubſequent year, the ſame method ſhall be obſerved, but the names drawn in the preceding year ſhall not be put into ſuch hat or box; and in every ſucceeding year ſuch method ſhall be obſerved by ſuch ſurveyor, ſo as to render the duty to be performed in kind equal amongſt the perſons liable thereto; which order of the juſtices, ſo far as the ſame ſhall be extended, ſhall ſuperſede the power or liberty of compounding, and ſhall be binding, and ſhall continue in force until diſcharged or varied by the juſtices at ſome ſubſequent ſpecial ſeſſions for the highways within ſuch limit, to be held in the week next after Michaelmas quarter ſeſſions, ſ. 6.

And if any perſon ſhall keep a team, and ſhall not occupy lands, &c. of £.30 per annum, in the pariſh where he ſhall reſide, but ſhall in part maintain his horſes and beaſts of draught uſed in ſuch team upon lands in adjacent pariſhes, it ſhall be lawful for the juſtices, at ſome ſpecial ſeſſions, to mitigate the duty or compoſition, as they think juſt, 13 Geo. III. c. 78. ſ. 40.

And the ſurveyor of every pariſh ſhall, on ſome Sunday in November, in every year, cauſe ten days notice at leaſt to be given in the church or chapel, and if no church or chapel, then at the moſt public place there, and repeat the like notice in ſuch church, &c. on the next ſucceeding Sunday, of the time and place when and where the perſons permitted, and inclined to compound, may ſignify to ſuch ſurveyor their intention to compound; and all perſons ſignifying the ſame, who ſhall then, or within one month after, pay to ſuch ſurveyor the compoſition, ſhall be diſcharged from the performance of ſuch duty, which compoſition ſhall be employed by the ſurveyor for the uſe of the highways; and no compoſition ſhall be permitted, unleſs paid at the day or within the time aforeſaid, ſ. 41.

But where the occupation of any lands, &c. ſhall be changed, or any new inhabitant ſhall come to reſide in ſuch pariſh, &c. after the time appointed for ſuch compoſition, then the perſons occupying ſuch lands, &c. or ſo reſiding in ſuch pariſh, ſhall be allowed to compound afterwards: provided they pay the compoſition money within fourteen days after they enter upon ſuch lands, &c. or come to reſide in ſuch pariſh; and every tenant of lands, &c. who intends to quit the poſſeſſion thereof within ſix months from the time fixed for making ſuch compoſition, may compound for half the duty, and the ſucceeding tenant may compound or perform duty in kind for the other half, 13 Geo. III. c. 78, ſ. 41.

And if the ſurveyor ſhall receive from any perſon a compoſition for more duty than ſhall be required from the other inhabitants within the ſame pariſh, for the ſame year, he ſhall repay ſuch extraordinary compoſition to ſuch perſons, ſo as to bring the duty to an equality, amongſt all ſuch inhabitants, ſ. 41.

And in every pariſh where any perſon ſhall keep a draught or plough, and no carriage, he ſhall pay to the ſurveyor 1s. for every horſe, or pair of oxen or neat cattle, uſed in ſuch draught, for every day's ſtatute-duty on the day ſuch duty is to be performed, or pay according to the rate aforeſaid for the lands, &c. which he ſhall occupy in ſuch pariſh, at the option of the ſurveyor, ſ. 42.

" *And as by ſeveral acts concerning turnpike-roads, part of the ſtatute-duty may be directed to be performed on ſuch roads, and in ſome places perſons liable thereto may have compounded for the ſame;*" it is therefore enacted, That in ſuch caſes, the ſurveyor of the highways of the pariſh, where ſuch compoſition ſhall have been made, ſhall pay to the treaſurer or ſurveyor of ſuch turnpike roads, a certain part of the compoſition-money received, to be proportioned according to the number of days duty which ſuch perſons were liable to perform on ſuch turnpike road; which money ſhall be laid out on ſuch part of the turnpike road as lies within the pariſh from which it was received, and not elſewhere; and if ſuch ſurveyor of the highways ſhall refuſe or neglect to pay the ſame, within twenty days after he ſhall have received the ſame, upon demand made by ſuch treaſurer or ſurveyor, the ſame ſhall be levied upon the goods of ſuch ſurveyor, as penalties are by this act to be levied, ſ. 44.

4. *What perſons may be aſſeſſed to a rate for defraying the extraordinary charges of ſuch repairs*]— " *As in ſome pariſhes there may not be materials for the repair of the highways, by reaſon whereof the ſurveyor may be forced to buy materials, and to make recompenſe for damage done by getting thereof; and as no proviſion is made for raiſing a fund to reimburſe the expenſes thereof, and alſo ſuch expenſes as the ſaid ſurveyors may incur, by erecting guide-poſts, and by making or repairing trunks, tunnels, plats, bridges, or arches, and by rendering ſatisfaction for damages done to lands for making of new ditches or drains; nor for the ſalary to be paid by ſuch pariſh to ſuch ſurveyors;*" it is therefore enacted, That upon application made by ſuch ſurveyor to the juſtices, at their ſpecial ſeſſions, and oath made of the money which he hath *bona fide* laid out, or which will be required for the purpoſes aforeſaid, the ſaid juſtices, or two of them, ſhall, by warrant under their hands and ſeals, cauſe an aſſeſſment to be made upon all occupiers of lands, &c. within ſuch pariſh, and

the ſame ſhall be collected by ſuch perſons, and allowed in ſuch manner as the juſtices, by their order at ſeſſions, ſhall direct; and the money raiſed ſhall be employed and accounted for, according to the direction of the juſtices; but no ſuch aſſeſſment, in one year, ſhall exceed ſix-pence in the pound, of the yearly value of the lands, 13 Geo. III. c. 78. ſ. 30.

Alſo if upon application of the ſurveyor of the highways for any pariſh, to the juſtices for the limit wherein ſuch pariſh lieth, at their general or quarter-ſeſſions, or at ſome ſpecial ſeſſions for the highways, the ſaid juſtices ſhall be ſatisfied, by oath, that the duty, and the money authoriſed to be collected, has been performed, applied, and expended according to this act, or ſhall be ſatisfied that the common highways, bridges, cauſeways, ſtreets, or pavements, belonging to ſuch pariſh, are ſo far out of order that they cannot be ſufficiently amended, paved, cleanſed, and ſupported, by the means before preſcribed (notice being firſt given of ſuch intended application at the church or chapel on ſome Sunday preceding ſuch quarter or ſpecial ſeſſions; or if the place be extraparochial, notice in writing being firſt given of ſuch intended application to ſome of the principal inhabitants reſiding in ſuch extraparochial place, a week at leaſt before ſuch ſeſſions); an equal aſſeſſment upon all occupiers of lands, &c. within ſuch pariſh, ſhall be made and collected by ſuch perſons, and allowed in ſuch manner, as the juſtices, by their order at ſuch ſeſſions, ſhall direct; and the money thereby raiſed ſhall be employed and accounted for, according to the orders of the ſaid juſtices, towards amending, paving, cleanſing and ſupporting ſuch highways, cauſeways, ſtreets, pavements and bridges, ſ. 45.

But the aſſeſſment laſt authoriſed, and the aſſeſſment before authoriſed, for buying materials, making ſatisfaction for damages, erecting guide-poſts, and paying the ſurveyor's ſalary, ſhall not together, in one year, exceed nine-pence in the pound, ſ. 46.

And if any perſon ſhall refuſe or neglect to pay the ſums aſſeſſed upon him, within ten days after demand, the ſame may be levied, by the ſurveyor or perſons authoriſed, by warrant under the hand and ſeal of one juſtice, by diſtreſs and ſale; and in default of diſtreſs, it ſhall be lawful for ſuch juſtice to commit the perſon refuſing, to the common gaol, there to remain until he ſhall have paid the ſum aſſeſſed, and the coſts, ſ. 67.

CHAP. VII.

Of Wrongs in reſpect to the Rights of Landlords.

WHATEVER does a laſting damage to the freehold or inheritance is waſte; and, in treating thereof, it is to be ſhewn that it may be committed; FIRST, in reſpect of houſes; SECONDLY, in reſpect of gardens, orchards, and the like; THIRDLY, in reſpect of land; FOURTHLY, in reſpect of timber and other trees.

FIRST, as to *houſes*; it is clear, from the ſtat. Marlb. 23, and ſtat. Glo. 5. that waſte may be done in houſes: thus, if the tenant pull down the houſes demiſed, it will be waſte; ſo if he ſuffers a houſe to be uncovered, whereby the timber decays, though the timber be not thereby

thrown down; so if the house was uncovered at the commencement of the lease, yet it will be waste if he pulls it down without the consent of the landlord; or if it was ruinous at the commencement, and he suffers it to be more ruinous; so if the tenant suffers glass windows to be broke or carried away, or the wainscot, benches, doors, furnaces, or the like, which are fixed to the house, to be removed, although they were originally fixed, by the tenant, by nails, screws, or otherwise. It is also waste if he permits the walls of a house to be decayed for want of plaistering, whereby the timber is rotted—or the chambers of a house, though the timber be not thereby rotted; so if he does not scour a drain, whereby the ground timber is decayed—so it will be waste if the walls are suffered to go to decay, though the timber was in decay at the commencement of the lease; and it will be waste though there be no timber upon the land demised for repairs; or though the house was uncovered by or damaged by tempest, if it be suffered afterwards to remain in decay; so it will be waste if the tenant pulls down the house and rebuilds it less than before, or if he rebuilds it larger to the prejudice of the landlord; for it is more charge to repair. So if the tenant alters the house to the landlord's prejudice; as, if he converts a parlour into a stable, or changes a corn-mill to a cotton- or fulling-mill, or the like. So it may be waste to turn two rooms into one; for if it would be for the lessor's advantage, it may be shewn on the other side. So it will be waste if the tenant builds a new house, and afterwards suffers that to be decayed.

However, in all questions respecting waste it is to be observed that, in regard to the repairs of houses, the tenant is not liable thereto, unless he holds the premises under a lease for a term of years, but the burthen thereof lies on the landlord. Thus, in the case of a tenancy at will, or from year to year, the landlord is under an obligation to keep the premises in tenantable repair; but, where there is an actual lease, the charge of repairing, without any express covenant for that purpose, is upon the tenant, reasonable or ordinary wear and use being allowed.

But, if the house was uncovered at the commencement of the lease, it is no waste if the tenant suffers it to fall into further decay, without pulling it down; or if the walls were uncovered, or insufficiently supported; or if the house was ruinous, and the tenant suffers it to be as it was, without permitting it to become more ruinous. So also it is no waste if the tenant removes furnaces, coppers, or other utensils of trade, though fixed to the freehold, if he removes them before the expiration of his term; but if he permits them to remain after the expiration of the term, he cannot remove them, for they are then vested in the reversioner or landlord.

In like manner green- and hot-houses are removeable; so a barn erected on the premises upon blocks of timber; and this notwithstanding there be a covenant to leave all buildings which then were or should be erected on the premises in repair; for such covenant means that the tenant shall leave all buildings annexed to and become part of the reversionary estate: but if the tenant will actually build, he must leave the buildings for the benefit of the landlord,—thus, if the tenant erect a beasthouse, he cannot remove it; for there is a distinction between erections necessary to the purposes of trade or manufactures, such as hot-houses or the like, and those that are requisite in order to the enjoyment of the land demised, such as beasthouses and the like; and therefore those of the latter description are not removeable by the outgoing tenant, but must remain for the benefit of the inheritance.

SECONDLY; as to *gardens, orchards*, and the like: waſte may be committed therein, if the tenant cuts down pear-trees, apple-trees, or other fruit-trees; or if they are thrown down by tempeſt, and the tenant afterwards roots them up, or cuts down the germins growing, without planting new.

So if the tenant deſtroys or ſuffers the ſtock of a dovecote, warren, park, fiſh-pond, pool, or the like, to be diminiſhed, or throws down the pales of a park or warren, or ſtops up the holes of a dovecote, or throws down the banks of a fiſh-pond. But if the tenant kills or deſtroys, yet it is no waſte if he leaves a ſufficient ſtock.

THIRDLY; as to *land*: it will be waſte if the tenant ſuffers the ſea to ſurround arable land, meadow, or paſture; or if he ſuffers a wall or bank againſt the ſea, a river, or the like, to be ruinous; by which the water ſurrounds or overflows the land, and renders it uſeleſs: ſo if he digs up the ſurface of the land, and carries it away; or if the tenant converts arable to wood, or wood land to arable, it will be waſte, or meadow to arable or paſture; or meadow to orchard or hop-ground—though it be done for the amelioration of the ſoil—or a hop-ground to tillage.

So if a tenant for life or years opens new mines in land, demiſed without mention of mines, it will be waſte; ſo if he digs for gravel, lime, clay, brick earth, ſtone, or the like, in pits not open.

But it is not waſte if land is ſurrounded or overflowed by the violence of a tempeſt, or if paſture be converted to tillage for the improvement of the ſoil, where it has been ſometimes paſture and ſometimes arable; or if it was ſtocked with rabbits, it not being a warren by charter or preſcription; ſo if it was a warren. So it is no waſte if the land lies fallow, though it is bad huſbandry; or if trenches are dug in a meadow to draw off the water; or if woad or the like be ſown againſt the end of the term, though it is not ripe for ſeveral years.

So it is not waſte to dig for ore, coal, or the like, in mines open at the time of the leaſe; or if mines were not demiſed, if the land was demiſed with all mines; neither will it be waſte for the rector or vicar to dig for or open mines in his glebe.

FOURTHLY; as to *timber and other trees*: it is waſte if a tenant cuts down timber: and oak, aſh, and elm, are timber after the age of twenty years, throughout the realm; and in ſome counties, where ſuch timber is ſcarce, beech, willow, hornbeam, and other trees, may be accounted timber, if they have been ſo deemed by cuſtom and immemorial uſage: And therefore if a tenant cuts down trees, which by law, or the immemorial uſage and cuſtom of the country, are eſteemed timber, it will be waſte; ſo it will be waſte if the tenant does an act by which the timber decays, as if he lops and tops them; ſo if he cuts down birch, willow, maple, or other trees, which are not timber, if they were growing in defence of the houſe; or if he roots up or deſtroys quickſets of white-thorn and the like; ſo if he extirpates or deſtroys the germins of underwood, which may be cut. It will alſo be waſte if the tenant cuts down trees for fuel, when there is dead and decayed wood ſufficient; or if he cuts down, for new pales, fences, a houſe, or the like, where none were before; ſo it is waſte if the tenant ſells the trees, and with the money repairs, or afterwards re-purchaſes and uſes for repairs; ſo if he cuts down for repairs which are not neceſſary, or for repairs when there ſhall be no occaſion, or for repairs which happened by his own default.

But cutting down trees which are not timber, nor ſtand for the defence of the houſe, is not waſte, nor trees that were timber, when they are dead. So cutting the underwood of oak, aſh, willow, or the like, is no waſte; ſo the cutting down buſhes, white-thorn, and the like, is no waſte; ſo cutting down timber for neceſſary *botes*, allowed by law to the tenant, is no waſte—as for fuel, plough bote, hedge bote, cart bote, and the like; or for repairs, ſuch as the repair of pales, gates, fences, and the like, though the tenant covenants to repair at his own charge, for this does not take away the liberty which the law allows; ſo though the landlord covenants to repair; or if it be for the repair of things uſeful, though they are not abſolutely neceſſary, ſuch as for water-troughs to be fixed in the ground for his cattle.

The remedy of the landlord againſt the tenant for waſte is either under the ſtatute of Glouceſter, 6 Ed. I. c. 5; whereby it is enacted, that if tenant for life or years do waſte, he ſhall forfeit the place waſted, and treble damages, or by a ſpecial action on the caſe in nature of waſte.

But here it is neceſſary to obſerve, that the tenant ſhall not be ſued under the ſtatute for waſte, if the value does not amount to 3s. 4d.; and therefore, if waſte is found only to the value of 3s. or leſs, no judgment ſhall be given, though the defendant confeſs the waſte; and if judgment is given for the plaintiff, it will be error.

Accordingly, in the caſe of *Harrow School* v. *Alderton*, 2 Boſ. & Pul. 86.; where, in an action of waſte, on the ſtatute of Glouceſter, the jury gave only three farthings damages; the defendant had leave to enter up judgment for himſelf.

CHAP. VIII.

Wrongs in reſpect of the Rights of Tenants.

If there is tenant for life or years of lands, the tenant has no property in the trees growing on the land; and even if the clauſe in the leaſe is without impeachment of waſte, it gives no property, but is merely an exemption from an action.

Yet if a ſtranger cuts any down, the tenant may maintain treſpaſs; but he ſhall not recover damages for the value of the trees, becauſe the property of them is in the landlord.

Alſo tenants for life, years, or at will, are liable to, or may have an action of treſpaſs, in reſpect of the *emblements* or *crop—growing on the lands*, on the determination of their eſtates.

And the doctrine of emblements extends not only to corn ſown, but to roots planted, or other annual artificial profits.

Hops growing out of antient roots have been held to be like emblements, which ſhall go to the huſband or executor of the tenant for life, and not to the landlord, and are not to be compared to apples or fruits, which grow of themſelves.

But it is otherwiſe of fruit-trees, graſs, and the like, which are not planted annually at the expenſe and labour of the tenant, but are either a permanent or a natural profit of the earth.

In ſome caſes, he who ſows the corn ſhall have the emblements; in others not.

Thus, if tenant in fee, or in tail, or in dower, die after ſowing the corn, and before ſeverance, his executor or adminiſtrator generally ſhall have the emblements.

For a tenant for life or his repreſentatives ſhall not be prejudiced by any ſudden determination of his eſtate; becauſe ſuch a determination is contingent and uncertain. But if a man ſows land and lets it for life, and the leſſee for life die before the corn be ſevered, his executor ſhall not have the emblements, but he in reverſion; though, if he himſelf had ſowed the land and died, it were otherwiſe.

The ſame is alſo the rule, if a life eſtate be determined by act of law.

Thus, every one who has an uncertain eſtate or intereſt, if, before ſeverance of the corn, his eſtate determine either by the act of God or of the law, he ſhall have the emblements, or they ſhall go to his executor or adminiſtrator;—and ſo it is in all caſes regularly, where a man ſows land whereof and wherein he hath ſuch an eſtate as may perhaps continue until the corn be ripe.

But if the eſtate be determined by the tenant's own act, as by forfeiture by tenant for life for waſte committed; or if a tenant during widowhood marries: in theſe and ſimilar caſes, the tenants having thus determined the eſtates by their own acts, ſhall not be entitled to take the emblements.

And the under-tenants or leſſees of tenants for life have the ſame, and in ſome inſtances greater indulgences than their leſſors, the original tenants for life. For the law of eſtovers and emblements, when the tenant for life is entitled thereto, is alſo the ſame with regard to his under-tenant, who repreſents him and ſtands in his place: and in thoſe caſes where the tenant for life ſhall not have the emblements becauſe the eſtate determines by his own act, the exception ſhall not reach his tenant or leſſee, who is a third perſon.

But with regard to emblements or the profits of lands ſowed by tenant for years, there is this difference between him and tenant for life; that where the term of a tenant for years depends upon a certainty, (as if he holds from Midſummer for ten years,) and in the laſt year he ſows a crop of corn, and it is not ripe and cut before Midſummer, the end of his term, his landlord ſhall have it; for the tenant knew the expiration of his term; and therefore it was his own folly to ſow that, of which he never could reap the profits*. In ſuch caſe the landlord, it is

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* But though this rule is general, yet it admits of certain exceptions, ariſing from the cuſtom of the country; as, where the plaintiff brought an action of treſpaſs for mowing and taking away *a crop of corn*, and relied on a cuſtom that the tenant, for any term of years which expired on the 1ſt of May, might, after the expiration of his term, take and carry away as his *way-going crop*, all the corn then growing on the land at the time the term expired. This cuſtom was adjudged to be good and reaſonable; though it was contended, that the tenant could not claim it againſt his deed, by which the land had been demiſed for a certain number of years then expired.

So a cuſtom that the tenant might leave, for a certain time, his way-going crop in the barns of the farm, which he had left after the determination of his term, and after his quitting the premiſes, is good; and the corn ſo left may be diſtrained, even though ſix months are expired from the end of the term.

ſaid, muſt enter on the lands, to take the emblements. But where the leaſe for years depends upon an uncertainty; as upon the death of the leſſor or landlord, being himſelf only tenant for life, or being a huſband ſeiſed in right of his wife; or if the term of years be determinable upon a life or lives; in all caſes of this kind, the eſtate for years not being certainly to expire at a time foreknown, but merely by the act of God; the tenant, or his executors, ſhall have the emblements in the ſame manner that a tenant for life would be entitled thereto. Not ſo, however, if it determine by the act of the party himſelf.

If tenant at will ſows his land, and the landlord before the corn is ripe, or before it is reaped, put him out, yet the tenant ſhall have the emblements, and free ingreſs, egreſs, and regreſs, to cut and carry away the profits; and this for the ſame reaſon upon which all the caſes of emblements turn; namely, the point of uncertainty; ſince the tenant could not poſſibly know when his landlord would determine his will, and therefore could make no proviſion againſt it; and having ſown the land, which is for the good of the public, upon a reaſonable preſumption, the law will not ſuffer him to be a loſer by it. But it is otherwiſe, and upon reaſon equally good, where the tenant himſelf determines his will; for in this caſe the landlord ſhall have the profits of the land.

So in the caſe of entry of the leſſor before ſowing, the leſſee at will, ſhall not have the coſts of ploughing and manuring.

If a huſband holds lands for life, in right of his wife, and ſows the land, and afterwards ſhe dies before ſeverance, he ſhall have the emblements. So where the wife has an eſtate for years, life, or in fee, and the huſband ſows the land and dies, his executors ſhall have the corn.

But if the huſband and wife are joint-tenants, though the huſband ſow the land with corn and die before it be ripe, the wife, and not his executors, ſhall have the corn, ſhe being the ſurviving joint-tenant.

Where lands ſown are delivered in execution upon an extent, the perſon to whom they are ſo delivered ſhall have the corn on the ground.

The advantages alſo of emblements are particularly extended to the parochial clergy by the ſtat. 28 H. VIII. c. 11. which conſiders all perſons who are preſented to any eccleſiaſtical benefice, or to any civil office, as tenants for their own lives, unleſs the contrary be expreſſed in the form of the donation: for by this ſtatute, if a parſon ſows his glebe and dies, his executors ſhall have the corn; and ſuch parſon may by will diſpoſe thereof.

Where there is a right to emblements, ingreſs, egreſs, and regreſs are allowed by law, in order to enter, cut and carry them away, when the eſtate is determined.

Emblements are diſtinct from the real eſtate in the land, and ſubject to many, though not all the incidents attending perſonal chattels: they were deviſeable by teſtament before the ſtatute of Wills, and at the death of the owner ſhall veſt in his executor, and not his heir; they are forfeitable by outlawry in a perſonal action; and by the ſtat. 11 G. II. c. 19. (though not by the common law) they may be diſtrained for rent arrear.

But though emblements are aſſets in the hands of the executor, are forfeitable upon outlawry,

and diſtrainable for rent, they are not in other reſpects conſidered as perſonal chattels, and in particular they are not at common law the ſubject of larceny before they are ſevered from the ground.

This conſideration has occaſioned the following ſtatutes to be paſſed for the protection of the occupier of lands as well as the landlord:

1. *Pulling down incloſures.*] *By* 13 *Ed.* I. *ſt.* 1. *c.* 46, *where ſometimes it chanceth that one having a right to improve, doth then levy a dyke or an hedge, and ſome by night or at another ſeaſon, when they ſuppoſe not to be eſpied, do overthrow the hedge or dyke, and it cannot be known by verdict of the aſſize or jury, who did overthrow the hedge or dyke, and men of the towns near, will not indict ſuch as be guilty of the fact; the towns near adjoining ſhall be diſtrained to levy the hedge or dyke at their own coſt, and to yield damages.*

And by 3 & 4 *Ed.* 6. *c.* 3, *ſuch perſon as ſhall bring an aſſize hereupon, and have judgment to recover, ſhall have his damages trebled by the judgment of the court.*

2. *Cutting growing corn, robbing of orchards or gardens, breaking hedges, pulling up fruit-trees, or ſpoiling wood growing.*] By 43 Eliz. c. 7, if any perſon ſhall cut, or unlawfully take away any corn growing, or rob any orchards or gardens, or break or cut any hedge, pales, rails, or fence, or dig, pull up or take up, any fruit-trees, to the intent to take the ſame away, or ſhall cut or ſpoil any woods or underwoods, poles or trees ſtanding (the ſame not being felony by the laws of this realm), every ſuch perſon, his procurers and receivers knowing the ſame, being convicted by confeſſion, or one witneſs, before one juſtice of peace, mayor, or other head officer, where the offence ſhall be committed, or the party apprehended, ſhall give ſuch recompenſe for the damages as by ſuch juſtice ſhall be appointed, for the firſt fault; and if ſuch offenders ſhall be thought, in the diſcretion of the juſtice, not able, or do not make ſatisfaction for the damages, the juſtice ſhall commit the offenders to ſome conſtable or other inferior officer, where the offence ſhall be committed, or the party apprehended, to be whipped; and for every ſuch offence for which the offenders ſhall be eſtſoons committed, to receive the ſaid puniſhment of whipping, ſ. 1.

And if any conſtable, or inferior officer, do not, at the command of any ſuch juſtice, execute by himſelf, or ſome other, the puniſhment limited by this ſtatute, it ſhall be lawful for the juſtice to commit him to the common gaol, until the offenders be by him, or by his procurement, whipped, ſ. 2.

But no ſuch juſtice ſhall execute this ſtatute for any offences done unto himſelf, unleſs he be aſſiſted with one or more other juſtices, whom the offence doth not concern, ſ. 3.

3. *Hedge-breakers and ſtealers of wood, gates, pales, &c.*] By 15 Car. II. c. 2, the conſtable may apprehend, or cauſe to be apprehended, every perſon he ſhall ſuſpect, having or carrying any burden of any kind of wood, underwood, poles, or young trees, or bark, or baſt of any trees; or any gates, ſtiles, poſts and pales, rails or hedgewood, broom or furze:—And by warrant of one juſtice, directed to any officer, ſuch officer ſhall have power to enter into and ſearch the houſes, outhouſes, yards, gardens, or other places, belonging to the houſes of every perſon they ſhall ſuſpect to have any wood, underwood, poles, or young trees, or bark, or baſt of any trees; or any gates, ſtiles, poſts, pales, rails, or hedgewood, broom or furze; and where

they ſhall find any ſuch, to apprehend the perſons ſuſpected, for cutting and taking the ſame: —And as well thoſe apprehended carrying, as thoſe in whoſe houſes and places the ſame ſhall be found, to carry before one juſtice. And if ſuch perſon do not then and there give a good account how he came by the ſame, ſuch as ſhall ſatisfy the ſaid juſtice, or elſe ſhall not in ſome convenient time, to be ſet by the ſaid juſtice, produce the party of whom he bought the ſame; or ſome credible witneſs, to depoſe upon oath ſuch ſale thereof, he ſhall be convicted of cutting and ſpoiling the ſame, and puniſhed according to the above ſtatute of 43 Eliz. and further by this act, ſ. 2.

That is to ſay, he ſhall for the firſt offence give the owner ſuch recompence or ſatisfaction for damages, and within ſuch time as the juſtice ſhall appoint; and over and above pay down preſently to the overſeers, for the uſe of the poor, ſuch ſum, not exceeding 10s., as the juſtice ſhall think meet; and if he do not make ſuch recompence, and alſo pay the ſaid ſum to the poor, the ſaid juſtice ſhall commit him to the houſe of correction for not exceeding one month, or to be whipped by the conſtable; and if he ſhall again commit the ſaid offence, and be thereof convicted as before, he ſhall be ſent to the houſe of correction for one month, to be there kept to hard labour; and if he ſhall again commit the ſaid offence, and be thereof convicted as before, he ſhall be deemed an incorrigible rogue, ſ. 2, 3.

And whoſoever ſhall buy any burdens of wood, or any poles or ſticks of wood, or any other the things aforeſaid, which may be juſtly ſuſpected to have been ſtolen, or unlawfully come by; it ſhall be lawful for one juſtice, upon complaint, to examine the matter upon oath; and if he ſhall find that the ſame was bought of a perſon who might juſtly be ſuſpected to have ſtolen, or unlawfully come by the ſame, and that the ſame was ſtolen, or unlawfully come by, he may award the party who bought the ſame, to pay treble value to him from whom it was unlawfully taken; and, in default of preſent payment, may iſſue his warrant to levy the ſame by diſtreſs; and in default of diſtreſs, to commit the party to gaol, at his own charge, there to remain one month, without bail, ſ. 4.

But no perſon ſhall be puniſhed for any offence upon this law, that hath been puniſhed for the ſame by any former law; nor unleſs he be queſtioned within ſix weeks after the offence, ſ. 5.

4. [*Deſtroying Timber-Trees, Fruit-Trees, or other Trees, or Plantations.*] By 37 Hen. VIII. c. 6. if any perſon ſhall maliciouſly, willingly, and unlawfully *bark any apple-trees, pear-trees, or other fruit-trees*, he ſhall forfeit to the party grieved double damages, by action of treſpaſs, at the common law, and alſo 10l. to the king.

But it is enacted by 1 Geo. I. ſtat. 2. c. 48. *to encourage the planting of timber-trees, fruit-trees, and other trees in fields, hedge-rows, gardens, walks, and elſewhere, either for ornament, ſhelter, or profit, and to prevent the malicious deſtroying or ſpoiling thereof*; that, if any perſon ſhall maliciouſly break down, cut up, pluck up, throw down, bark, or otherwiſe deſtroy, deface, or ſpoil any timber-tree or trees, fruit-tree or trees, or any other tree or trees, the perſon damaged ſhall receive ſuch ſatisfaction and recompence from the inhabitants of the pariſh, town, hamlet, vill, or place; to be viewed, anddamages and coſts to be recovered in the ſame manner as hedges and ditches overthrown in the night may by the ſtat. 13 Ed. I. c. 46., unleſs the party offending ſhall by ſuch pariſh or place be convicted of ſuch offence within ſix months, ſ. 1.

And as doubts had arisen on this last act, whether such offences were punishable if committed in the day time, the *stat.* 6 Geo. I. c. 16. *was passed to explain and amend the same, and also to extend the provisions thereof to the destroyers of hedges and other fences: by which said act it is enacted as follows*; that is to say:

If any person whatsoever shall, either *by day or by night*, cut, take, destroy, break, throw down, bark, pluck up, burn, deface, spoil, or carry away any *wood springs, or springs of wood, trees, poles, wood, tops of trees, underwoods, or coppice woods, thorns, or quickfets*, without the consent of the owner of such woods, wood grounds, parks, chaces, or coppices, plantations, timber-trees, fruit-trees, or other trees, thorns, or quickfets, or of the person chiefly entrusted with the care and custody thereof; or shall break open, throw down, level, or destroy any *hedges, gates, posts, styles, railing, walls, fences, dykes, ditches, banks, or other inclosures* thereof; the owner may have such satisfaction and recompence from the inhabitants of the parishes, towns, hamlets, villages, or places joining on such grounds, and recover such damages against such place or places, and in the same manner and form as by the above statute of the 13 Ed. I. c. 46., unless the offender, by such parishes or places, be convicted within six months, 6 Geo. I. c. 16. s. 1.

But *if the offender is known*, then the following proceedings shall take place:

That is to say, if any offender shall, in a riotous, open, tumultuous, or in a secret or clandestine manner, forcibly or wrongfully or maliciously, and without the consent of the owner, or person chiefly entrusted with the care of the above-mentioned premises, commit any of the offences restrained by the said acts of 1 Geo. I. stat. 2. c. 48. or 6 Geo. I. c. 16., two justices, or the justices in sessions, on complaint made by the inhabitants of such parish or place, or by the owner of the wood or trees, or any other, may cause the offender to be apprehended, and hear and determine the offence, and on conviction shall commit the offender to the house of correction to hard labour for three months; and where there is no house of correction, then to the prison for four months; and shall also order the offender to be publicly whipped by the master of such house of correction once a month, during such three months, in the borough or corporation, if the offence be committed therein; or in the market-town where the house of correction stands, or in the next market-town next adjacent to such house of correction, on the market-day: and in the county where such offence shall be committed, on the market-day, between the hours of eleven and two; and where there is no house of correction, the said justices shall order him to be whipped by the common hangman, once a month, during such four months, on the market-day of any borough or corporation, where such offender shall be committed; or on the market day of some town, between the hours of eleven and two o'clock, 1 Geo. I. stat. 2. c. 48. s. 2. 6 Geo. I. c. 16. s. 2.

And before such offender shall be discharged, he shall find sufficient sureties for his good behaviour for two years, 1 Geo. I. stat. 2. c. 48. s. 3. 6 Geo. I. c. 16. s. 2.

5. [*Destroying Trees growing on Wastes.*] Also by 29 Geo. II. c. 36. if any person shall unlawfully cut, take, destroy, break, throw down, bark, pluck up, burn, deface, spoil, or carry away, any tree, growing in any waste, wood, or pasture, in which any person or body politic hath right of common, every such offender shall be in like manner convicted of such offence, and incur the like penalty as is directed by 6 Geo. I. c. 16. s. 8.

And the parties may take their remedy for damages, either againſt the pariſh or place where the offence ſhall be committed, according to the above acts 1 Geo. I. c. 48, and 6 Geo. I. c. 16. or on the hundred, according to the ſtat. 9 Geo. I. c. 22. ſ. 7, as to them ſhall ſeem moſt meet, ſ. 9.

6. [*Deſtroying Timber-Trees in Foreſts or Chaces.*] By 6 Geo. III. c. 48. every perſon who ſhall wilfully cut or break down, bark, burn, pluck up, lop, top, crop, or otherwiſe deface, damage, ſpoil, or deſtroy, or carry away, any *timber-tree, or any tree likely to become timber*, or any part thereof, or the lops or tops thereof, without the conſent of the owner thereof firſt had, or in any of his majeſty's foreſts or chaces, without the conſent of the ſurveyor, or his deputy, or perſon entruſted with the care of the ſame, and ſhall be thereof convicted upon the oath of one witneſs, before one juſtice, ſhall, for the firſt offence, forfeit not exceeding £. 20. together with the charges previous to and attending ſuch conviction, to be aſcertained by ſuch juſtice; and upon non-payment thereof, ſuch juſtice ſhall commit the offender to the common gaol, for not exceeding twelve, nor leſs than ſix months, or until the penalty and charges be paid; —and if any perſon ſo convicted ſhall be guilty of the like offence a ſecond time, and ſhall be thereof convicted in like manner, ſuch perſon ſhall forfeit not exceeding £. 30, together with the charges attending ſuch conviction; and upon non-payment thereof, ſuch juſtice ſhall commit the offender to the common gaol, for not exceeding eighteen, nor leſs than twelve, months, or until the penalty and charges be paid. And if any perſon ſo convicted ſhall be guilty of the like offence a third time, and ſhall be thereof convicted, ſuch perſon ſhall be guilty of felony, and the court before whom he ſhall be tried ſhall tranſport ſuch perſon for ſeven years, ſ. 1.

And all oak, beech, cheſnut, walnut, aſp, elm, cedar, fir, aſh, lime, ſycamore, birch, (*poplar, alder, larch, maple, and hornbeam trees*, 13 Geo. III. c. 33.) ſhall be deemed timber-trees within the meaning of this act, ſ. 2.

7. *Deſtroying Underwoods, Hollies, or the like.*] Alſo every perſon who ſhall go into the woods, under-woods, or wood-grounds, of any of his majeſty's ſubjects, not being the owner thereof, (or into any of his majeſty's foreſts, or chaces, 9 Geo. III. c. 41. ſ. 8.) and ſhall there cut, lop, top, or ſpoil, ſplit down, or damage, or otherwiſe deſtroy, any kind of wood or under-wood, poles, ſticks of wood, green ſtubs, or young trees, or carry or convey the ſame away, (or *ſhall by night or day cut down, deſtroy, take, carry or convey away, any hollies, thorns, or quickſets, there growing or being*, 9 Geo. III. c. 41. ſ. 8.) or ſhall have in his cuſtody any kind of wood, under-wood, poles, ſticks of wood, green ſtubs, or young trees, (*or any ſuch hollies, thorns, or quickſets*, 9 Geo. III. c. 41. ſ. 8.) and ſhall not give a ſatisfactory account how he came by the ſame, and ſhall be thereof convicted before one juſtice, on the oath of one witneſs, ſhall for the firſt offence forfeit not exceeding 40s. together with the charges attending ſuch conviction; and if the ſame be not forthwith paid on conviction, the juſtice ſhall by warrant commit him to the houſe of correction for one month, to hard labour, and to be once whipped there;—and if any perſon ſhall commit any of the offences aforeſaid a ſecond time, he ſhall forfeit not exceeding £. 5, together with the charges attending ſuch conviction; and if the ſame be not forthwith paid on conviction, the juſtice ſhall by warrant commit him to the

houſe of correction for three months, and to be whipped there, once in every one of the ſaid three months; and if a third time, ſuch perſon convicted thereof ſhall be deemed an incorrigible rogue, and puniſhed as ſuch, ſ. 4. 6.

And the juſtices for the counties, cities, ridings, diviſions, or places wherein any offences againſt this act ſhall be done, are to put this act in execution, ſ. 5.

And one moiety of all forfeitures, not otherwiſe directed, ſhall go to the informer, and the other to the perſon aggrieved, ſ. 8.

And if any perſon ſhall hinder, or attempt to prevent, the ſeizing or ſecuring any perſon employed in carrying away any ſuch timber, or other trees, ſuch perſon ſhall forfeit £.10 to the perſon who ſhall convict ſuch offender; and if not paid on conviction, the perſon convicted ſhall be committed to the houſe of correction to hard labour, for not exceeding ſix calendar months, ſ. 7.

And for the better preventing the deſtruction of timber-trees, and other trees, under-wood, and covert, in foreſts and chaces, it is enacted by 4 Geo. III. c. 31. that it ſhall be lawful for every ſurveyor of his majeſty's woods, and his lawful deputy, and for the officers and keepers of any foreſt or chace (beſides the penalties for deſtroying the trees or under-wood), to ſeize and take away for his own uſe, any ſaw, axe, hatchet, bill-hook, or other inſtrument uſed by any perſon whom they ſhall find unlawfully plucking up, ſawing, cutting down, topping, lopping, or deſtroying timber-tree, or other tree, underwood, or covert, within ſuch foreſt or chace.

8. [*Deſtroying Plantations, Nurſeries, or Gardens.*] Alſo by the ſaid ſtat. 6 Geo. III. c. 48. every perſon who ſhall pluck up, or cut, ſpoil, or deſtroy, or take away, any root, ſhrub, or plant, out of the fields, nurſeries, gardens, or garden-grounds, or other cultivated lands, of any perſon whomſoever, without the conſent of the owner firſt had, and ſhall be thereof convicted upon the oath of one witneſs, before one juſtice, ſhall for the firſt offence forfeit not exceeding 40s. together with the charges previous to and attending ſuch conviction, to be aſcertained by ſuch juſtice; and if the ſame are not paid down upon conviction, forthwith, the ſaid juſtice ſhall by warrant commit him to the houſe of correction for one month to hard labour, and to be once whipped there;—and if any perſon ſo convicted ſhall again commit the like offence, and be convicted in manner aforeſaid, ſuch perſon ſhall for ſuch ſecond offence forfeit not exceeding £.5, together with the charges attending the conviction; which if not paid down upon conviction, forthwith, the ſaid juſtice ſhall by warrant commit him to the houſe of correction for three months, and to be whipped there once in every of the ſaid three months. And if any perſon ſo before convicted ſhall a third time commit the like offence, and ſhall be thereof convicted, ſuch perſon ſhall for ſuch third offence be deemed guilty of felony, and the court before whom he ſhall be tried, ſhall tranſport ſuch perſon for ſeven years, ſ. 3. 6.

9. [*Stealing Turnips, Potatoes, Cabbages, Parſnips, Peaſe, or Carrots growing.*] Alſo by 13 Geo. III. c. 32. and 42 Geo. III. c. 67. if any perſon ſhall ſteal and take away, or maliciouſly pull up, *injure*, or deſtroy, any turnips, potatoes, cabbages, parſnips, beans, peaſe, or carrots, growing or being in any garden, lands, or grounds, open or incloſed, and ſhall be thereof convicted, on a proſecution begun within thirty days after the offence, before any

juſtice, either by the confeſſion of the party offending, or by the oath of one witneſs, every perſon ſo offending, and being convicted, ſhall forfeit not exceeding 20s. over the value of the goods ſtolen, as to ſuch juſtice ſhall ſeem meet; which ſhall be diſtributed between the owner of the goods, and the overſeers for the uſe of the poor, in ſuch proportion as ſuch juſtice ſhall think fit; or the whole ſhall be given to the owner or to the overſeers, according to the diſcretion of ſuch juſtice; and in default of payment, ſuch juſtice ſhall commit ſuch offender to the houſe of correction, to be kept to hard labour for not exceeding two months, unleſs ſuch penalty be ſooner paid, ſ. 1.

And in all informations, and other proceedings, the evidence of the owner and of the inhabitants of the pariſh ſhall be taken, 13 Geo. III. c. 32, ſ. 2.

But where the conviction ſhall be upon the oath of the owner, the whole of the penalty ſhall be paid to the overſeer for the uſe of the poor, ſ. 3.

10. [*Deſtroying Timber- or other Trees, or any Roots, Plants, or Shrubs in the Night.*] By 22 & 23 Car. II. c. 7. if any perſon ſhall, in the night-time, malicioufly, unlawfully, and wittingly deſtroy any plantations of trees, or throw down any incloſures, he ſhall forfeit to the party injured treble damages, to be recovered by action of treſpaſs, or upon the caſe; but upon requeſt of the party injured, three juſtices of the peace may within ſix months inquire thereof, as well by a jury, as by examination of witneſſes upon oath, or by any lawful ways which to them ſhall ſeem meet, ſ. 5, 6, 7.

And it is enacted by 6 Geo. III. c. 36. that every perſon who ſhall *in the night-time* lop, top, cut down, break, throw down, bark, burn, or otherwiſe ſpoil or deſtroy, or carry away any oak, beech, aſh, elm, fir, cheſnut or aſp, timber-tree, or other tree ſtanding for timber, or likely to become timber, without the conſent of the owner thereof; or ſhall *in the night-time* pluck up, dig up, break, ſpoil, or deſtroy, or carry away *any root, ſhrub, or plant, roots, ſhrubs, or plants of the value of* 5s. and which ſhall be growing and being in the garden-ground, nurſery-ground, or other incloſed ground of any perſon; or ſhall be aiding or aſſiſting therein, or ſhall *buy or receive ſuch root, ſhrub, or plant, roots, ſhrubs or plants of the value aforeſaid*, knowing the ſame to be ſtolen, ſhall be guilty of felony and tranſported for ſeven years.

[*Damage Feaſant.*] Where an injury has been done by the cattle or goods of any one to the lands of another, he who receives the injury may either diſtrain them while doing the damage, or bring his action of treſpaſs, and recover for the damage ſuſtained; but he ſhould make his election of his remedy; for if he diſtrains, and the diſtreſs eſcapes, the action of treſpaſs is gone, unleſs the eſcape was not through his fault or neglect; and it is to be obſerved that this action may be brought againſt him who has only the care, cuſtody or poſſeſſion of the cattle which do the damage.

If the tenant's goods are diſtrained for tolls or cuſtoms pretended to be due, he may bring his action for the taking, in which the right to the tolls will be tried.

[*Hunting.*] In reſpect to injuries from hunting or the purſuit of game, the following points are neceſſary to be noticed in this place:

Any perſon may juſtify going upon the lands of another *in purſuit of ravenous beaſts*, as foxes, badgers, and the like: for the taking of them is of public benefit; but he cannot juſtify to break the ground, or dig for them.

So it will not juſtify any exceſſive or unreaſonable damage to the land; for the juſtification is only as to the following, and ſhould be done with as little damage as poſſible: and therefore if to treſpaſs for ſuch cauſe, the defendant juſtifies for following a fox or ſuch beaſt, and in fact has committed unneceſſary miſchief, the plaintiff muſt, in his pleading, newly allege and prove exceſſive and unneceſſary injury.

But in general it is treſpaſs at common law for any man to hunt on another's ground; and the owner or tenant of the ſoil may maintain his action of treſpaſs for the ſame.

Yet if the party is qualified according to the ſtatutes to kill game, and the damage found be under 40s. unleſs the title to the land was chiefly in queſtion, the defendant ſhall, in ſuch caſe, pay no more coſts than damages.

But for preventing *wilful and malicious treſpaſſes*, the ſtat. 8 & 9 Will. III. c. 11. ſ. 4. enacts, that in all actions of treſpaſs wherein, at the trial of the cauſe, it ſhall appear and be certified by the judge under his hand on the back of the record that *the treſpaſs upon which any defendant ſhall be found guilty was wilful and malicious*, the plaintiff ſhall recover not only his damages, but his full coſts of ſuit.

Under this ſtatute, therefore, if the owner or tenant of the land expreſsly forewarns another not to come thereon, he will, in an action of treſpaſs, ſubſequent thereto, be entitled to full coſts, notwithſtanding the damages recovered be under 40s.; for every treſpaſs is wilful where the defendant has notice, and is eſpecially forewarned not to come on the land.

And if a general notice be given, not to treſpaſs on certain lands, and another hunts over a cloſe belonging to the party giving ſuch notice, the judge on the trial of an action for ſuch treſpaſs is bound under the above ſtat. 8 & 9 Will. III c. 11. ſ. 4. to certify that it was wilful and malicious, in order to entitle the plaintiff to his full coſts; notwithſtanding it appear on the trial, that the defendant was anxious to avoid treſpaſſing on the ground, and that he made frequent enquiries reſpecting the plaintiff's boundaries.

[*Gleaning.*] The idea which prevails among the lower claſſes of the community, that they have a right at common law TO GLEAN OR LEASE in the harveſt-fields, is ill founded; for unleſs there be an immemorial cuſtom or uſage in the pariſh to the contrary, no ſuch right can be claimed by any perſon whatſoever; and if any one, under ſuch pretended right, enters upon the land of another, the owner or tenant may bring an action of treſpaſs; and even where by immemorial cuſtom or uſage ſuch privilege is veſted in the poor and indigent pariſhioners, they can only exerciſe the right by *gleaning and gathering the ears of corn after the crop is drawn off.*

☞ *THE Reader is requeſted to add to Chapter* VI. *in this Appendix, which treats of the Highway Duty, viz. in Page* 1247—*the following Act, which was paſſed after the Sheet had been worked off.*

By the ſtat. 44 Geo. III. c. 52. ſo much of the act, 34 Geo. III. c. 74. as relates to the amount of the ſums to be paid by perſons deſirous of compounding for the performance of Statute Duty, is repealed; and in lieu thereof perſons MAY COMPOUND by paying to the Surveyor ſums of money, as the Special Seſſion held in the firſt week after the Michaelmas Quarter Seſſion ſhall adjudge, not exceeding 12s, nor leſs than 3s. for each team, draught, or plough for each day; and in default of their adjudging the ſame, 6s. for every day's duty for each; and for each cart with two horſes or beaſts of draught, not exceeding 8s. nor leſs than 3s. and in default of their adjudging the ſame 4s.—and for each cart with one horſe or beaſt of draught, not exceeding 6s. nor leſs than 2s., and in default of their adjudging the ſame, 3s.

END OF THE APPENDIX.

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TO THE PRINCIPAL SUBJECTS.

☞ *See also the copious Table of Contents prefixed to each Volume.*

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